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Horticultural Implements

Crop Protection Exhibition Preview

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WORLD CROPS

UNIVERSITY OF MICHIGAN
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The International Journal of Agriculture

VOLUME 10, No. 5 MAY 1958

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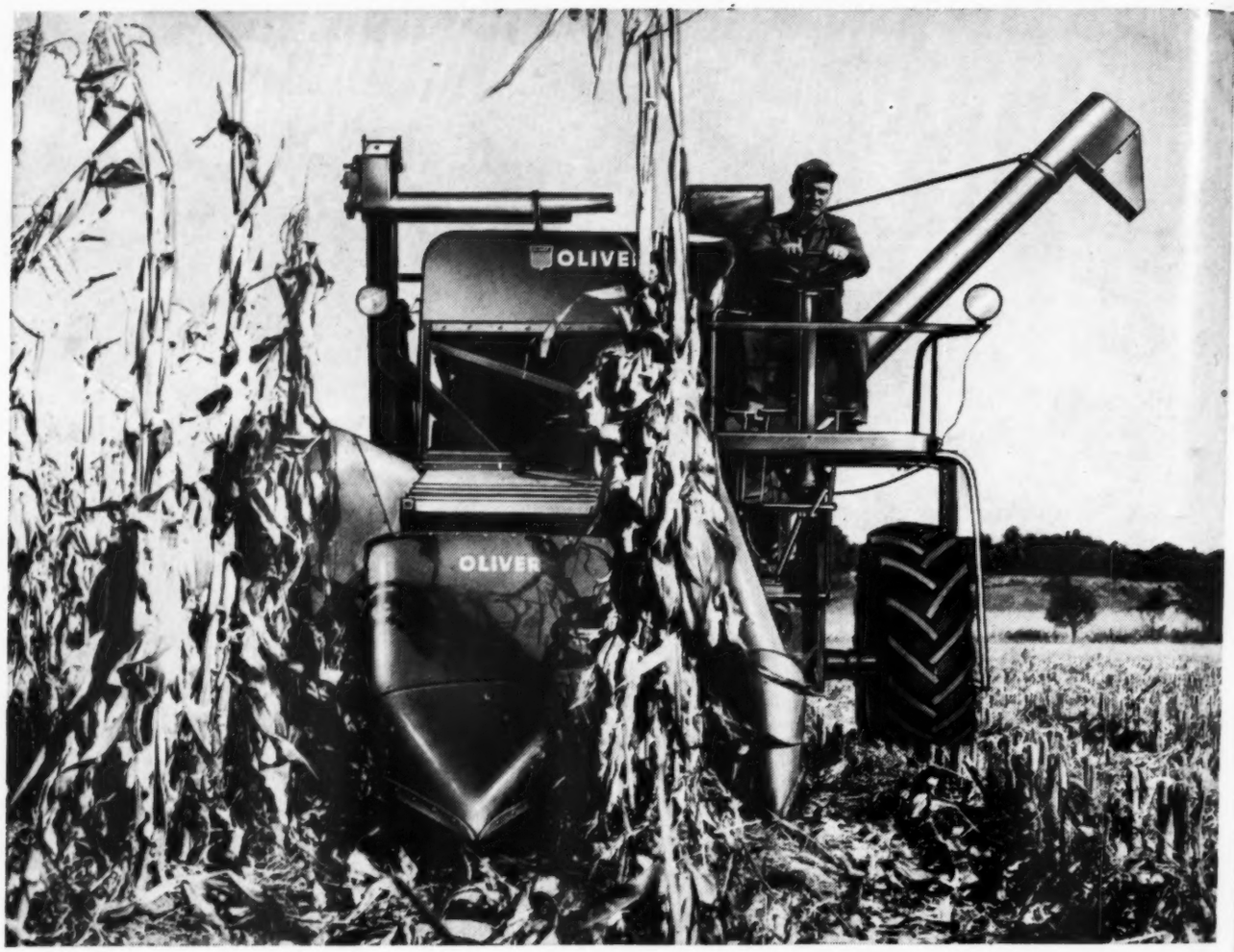
The Micron Twin, a new automatic concentrate sprayer, driven from tractor p.t-o., for the treatment of fruit and plantation crops. To be seen at the Crop Protection and Pest Control Exhibition



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★ Stalks are cut off, fed directly to the threshing machinery. There are no snapping rolls to shell the ears and waste your crop. And it handles any row width from 38 to 42 inches.

★ Ears are shelled and cleaned *inside*, just like a grain crop. Every kernel is saved.

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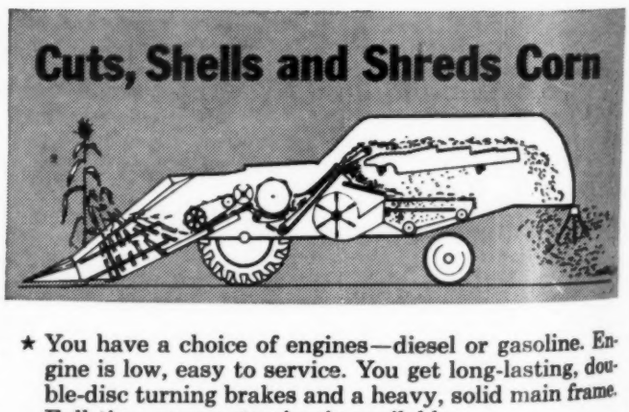

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We will be glad to furnish complete information on this new, money-saving way to harvest corn. Write us soon.

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Editorial Comment

War on waste!

THERE IS an enormous preventable waste of the world's food supplies owing to the damage and depredations caused by vermin, insect pests, plant diseases and hostile soil organisms, which either reduce crop yields or destroy food after it has been harvested. It has been estimated that one-third of everything that the planter, the farmer and the horticulturist grows is lost in this way. In the rival world of pests there is, of course, no distinction between what is ours and what is theirs. To them food is food and it is of no consequence whatever to them that if they eat well we may not eat at all.

For the first time in the long history of our planet Man is, however, turning the tide in the never-ending war against this rival world, and thus making it possible for the rate of production of food to keep pace, for the time being, with the ever-increasing population of our overcrowded world – a subject that was dealt with in such masterly fashion by Professor L. Dudley Stamp in the April issue of WORLD CROPS.

In the year 1845 the potato crop in Ireland was totally destroyed by blight; one-third of the population died in the subsequent famine and 1½ million people were forced to emigrate. Today conditions favourable to potato disease can be detected by means of the blight forecaster, the appropriate fungicide can then be applied to the plant, using one of the many types of sprayer now available on the market, and thus the whole crop can be saved.

The scientists who have developed such new plant-protecting chemicals, and the engineers and designers who have produced the machines and equipment to apply these new materials, have in a little more than ten years brought about a revolution of far-reaching consequences to mankind.

Thus the world's first CROP PROTECTION AND PEST CONTROL EXHIBITION, which is to be held at the Royal Horticultural Society's New Hall, London, from 12 to 15 May, can be said to be overdue and those who attend will see for the first time assembled under one roof a complete range of the most modern instruments of war on waste.

The Department of Industrial and Scientific Research has taken two stands to show the important work that is being done by the Pest Infestation Laboratory; another exhibit which is sure to attract a great deal of attention will be the display of the many uses of the pyrethrins in insecticide formulations which is being arranged by the African Pyrethrum Technical Information Centre. A preview of what to see begins on page 161.

Scent waves

ACCORDING TO *D. & O. News*, ' enticing scent waves are being used to lure insect pests to their doom. The wandering gipsy moth may think it is on the trail of a female moth . . . the hungry Mediterranean fruit fly may fancy there is a good dinner in prospect '.

Many natural and synthetic attractants are now being developed by the U.S. Department of Agriculture for use in fly traps. The attractant may be used either to lure the pest into a baited trap or to persuade it to eat a poison bait.

U.S.D.A. chemists are examining hundreds of natural plant materials and a host of organic synthetics. Common weeds, obnoxious plants, vegetables and flowers are under investigation in the hope of finding new attractants, and when working on synthetics a hundred or more related compounds may need to be tested. The best one found for use against the Mediterranean fruit fly is the secbutyl ester of 6-methyl-3-cyclohexene-1-carboxylic acid.

Small-scale farming

THE FARMING of small acreages in Japan, China, Malaya, Indonesia, Burma, Siam and Ceylon, aggregating many, many millions of acres, would in western countries be described as market-gardening. Rice – the staple food in these countries – is still grown almost entirely by manual labour and with the aid of draught animals. The amazing versatility of that age-old implement, the *mamoti*, *chongkil*, *tsuda*, or mattock, the simplicity of harvesting and threshing by hand, and the suitability of the domestic buffalo for providing extra power, when required, are together responsible for the stagnation that has set in in small-scale farming in all these countries, except for Japan.

Japan is mechanising, slowly but surely, because it is recognised that *the income from the farming of very small acreages is not sufficient for the maintenance of the farmer and his family at a subsistence level*, according to Mr. Ray Wijewardene, an agricultural engineer and proprietary planter from Ceylon, who incidentally contributes an article on the subject of small-scale mechanisation which appears on page 183.

There in a nutshell is the problem of the East today. With ever-increasing populations the available agricultural land is being carved up by successive inheritance or by government edict into smaller and still smaller blocks, the idea being that everyone will be contented once he is a landowner. The increasing misery arising from this economic folly is overlooked. With increasing morcellment, or fragmentation of land, the volume of human misery is inevitably growing.

In Japan, where the pressure of population on the available land is probably the greatest in the world, the farmer is forced to do other work to keep himself and his family alive. He uses fertilisers and manures on a heavy scale and also fungicides and insecticides so as to obtain maximum yields, and he uses small machines to reduce to a minimum the work he has to do on his small plot, particularly during periods of peak labour requirements. This makes it possible for him to engage in other work for a wage, to keep livestock or to go fishing. From this it would appear that increasing mechanisation, even for the smallholder, is one answer to the economic riddle of the East in the face of advancing population.

Here, then, is yet another field for the application of foreign aid and an opportunity for the manufacturers of small mechanical implements – seed drills, weeders, roto-cultivators, roto-bunchers for harvesting, and small machines for threshing, winnowing and milling. It is obvious that it is in the under-developed regions of the world where lie the greatest opportunities for development, providing financial aid is forthcoming to finance such transactions.

But ' honesty is needed in accepting foreign aid ', as Sir John Russell has said in a recent speech at Oxford. It is, we consider, unfair and ungrateful to play one great nation off against another. Equally, too, the donor nations should not make stipulations or ' attach political strings ' which place the recipient nation in a humiliating position. Aid is best given, not in cash, but in the form of machines, seeds, fertiliser, agricultural chemicals or other supplies in kind, as a straight business transaction, based on a long-term loan or credit. Charity may be accepted, but it is secretly resented.

Mediterranean olive fly

FAO REPORTS that its years of patient work in organising preventive control measures in countries at present suffering major damage from the olive fly – Italy, Spain, France, Greece, Morocco, Portugal and Yugoslavia – are showing encouraging results.

This fly causes an enormous direct loss in the countries most affected, amounting to 15% of total production and valued at approximately £110–£120 million per annum. In addition, an even higher intrinsic loss follows the down-grading of the product due to the damage caused by insect infestation, which increases the acidity of the derived oil to as much as 20%, compared with the normal mean of 4%–5%.

Although this pest is at present confined to the countries bordering the Mediterranean, FAO records show that insect pests can ' jump ' thousands of miles and appear in countries hitherto free, due to seeds, larvae or adult insects in goods and even in passengers' clothing being carried by air. Thus olive growers and olive oil producers in all countries are directly interested in the results of the campaign, and particularly so as any form of pest in olives is extremely difficult to control, owing to the method of cultivation of the trees and the hilly terrain in which they are usually grown. These factors make normal pest control measures impracticable due to the high relative cost per tree compared with the value of the derived crop.

The use of phosphorus and other direct-acting insecticides, while potentially giving promise, involves the danger of leaving toxic residues and possibly ' off ' flavours in the fruit. It is not with pesticides applied to the fruit, but through preventive techniques that effective control measures have been developed. These consist of attacking the insects which have hibernated throughout the winter and are most active at the beginning of summer, before the fruit has formed. They have yielded such directly positive results that FAO has been asked to extend its studies to similar control measures for other pests of the olive.

Canadian potash

WITH THE relentless increase in world population, future demand for potash should increase, and as the existing farmlands become depleted of their plant nutrients by repeated cropping without replacement, more and more potash will be needed to restore them, or else they will cease to be productive. About 90% of existing world production, mainly in Germany and France, is used in fertilisers, the remainder in manufacturing industry.

Potash can, indeed, be loosely described as the most essential plant nutrient and therefore its increased production and equitable distribution will be a potent factor in the maintenance of world peace. Agriculture, and not the production of nuclear weapons, guided missiles or inter-planetary rockets and other expensive products of modern civilisation, is still the foundation upon which the life of mankind depends.

It is therefore good news to everyone – producers and consumers alike – that plans for the exploitation of the immense deposits of potash recently discovered in the Province of Saskatchewan, Canada, are approaching fruition. According to *The Financial Post of Canada*, this rapidly developing industry will be in production before the end of this year, when the Potash Co. of America will commence operations at its property near Saskatoon.

The sinking of a 3,300-ft. shaft will be completed in June and the construction of the surface installations in November. According to this report, the extraction plant is designed to treat 4,000 tons of ore daily, and the total cost of the project is about U.S. $20 million – about £7 million.

Other companies, each of them $20-million ventures, also have development projects in this area. The United States Borax and Chemical Co. is considering similar operations near Saskatoon, and at Esterhazy,

150 miles north-east of Regina, International Minerals and Chemical Corp. is undertaking the development of an area where the mine shaft will go down to 3,000 ft. and it is expected that this will be completed in 1960. Work has also been begun on the sinking of a shaft at Unity in western Saskatchewan by the Continental Potash Co. The Winsal Co. of Canada, a subsidiary of Castrop-Rauxel, of West Germany, have purchased two areas of land with subsurface potash, one of 96,640 and the other 28,000 acres in the Melville and Yorktown districts of this Province.

Botanic gardens

MODERN SCIENCE had its beginnings in Italy and it is, therefore, not surprising that the first botanic gardens are those of Pisa and Padua, founded by their universities in the 16th century, their object being to teach the use and recognition of medicinal herbs to future medicos. The Oxford Botanic Gardens were laid out by the University in 1621, and the Jardin des Plantes in Paris by Louis XIII in 1626, both for the same purpose. The Chelsea Physic Garden was founded by the Apothecaries' Society in 1673.

In 1753 the Swedish botanist, Linnaeus, published his *Species Plantarum*, giving all the then known plants a binomial system of nomenclature, which included the generic name, followed by that of the species. A botanic garden was then laid out by Linnaeus to show the new system of classification, and living plants from all over the world were brought in for study. Thus the second phase in the function of botanic gardens began. The Kew Royal Botanic Gardens were founded in 1759 for similar work on plant species.

The first tropical botanic garden was established by the French at Pamplemousses, Mauritius, in 1735. Plant specimens were introduced from other tropical countries and later these gardens played a part in the founding of the sugar industry on the island. Charles III of Spain ordered the establishment of the first botanic garden in Mexico in 1781. The first British tropical botanic garden was established at St. Vincent, founded in 1764, followed by those in Jamaica in 1774, Calcutta in 1786, Penang in 1796, Trinidad in 1819, Peradeniya (Ceylon) in 1821 and Singapore in 1822. The Dutch founded the gardens in Buitenzorg, Java, in 1817.

These tropical gardens had the task of growing, collecting and distributing indigenous and exotic plants of promise, of giving advice to early planting communities and doing the early work on the control of pests and diseases. Fundamentally, however, the study was botany. Early in the present century agricultural and forest departments were set up in most tropical territories and much of the work formerly handled by the gardens was taken over by them. Special research stations dealing with specific crops, such as tea, rubber, cocoa, oil palms, coconuts and coffee, further lightened the load, whilst some botanic gardens were actually absorbed into the new departments.

Many of the major plantation products of the tropics are produced largely in countries far removed from the region of origin. Thus South American rubber is now grown in Ceylon, Malaya, Indo-China and Indonesia, cacao in West Africa and Malaya, and quinine in Indonesia. Central American vanilla is grown in Madagascar, and African coffee in Brazil. Cloves and nutmegs from the Moluccas are produced in Zanzibar and Grenada, and sugar, bananas and limes from South-East Asia are produced in the West Indies. Tea from China and Further India is grown in Assam, Ceylon, Indonesia and Africa. The botanic gardens have played a leading part in these important economic developments and this great work, fostered by the much-maligned colonial powers, should not now be forgotten.

Materials of construction

THE VERY rapid progress in the field of agricultural chemicals during the last decade has opened a new field for research into the materials of construction which are most suitable for the dusters and sprayers used to apply them. It was quite apparent from the address given recently to the members of the Pesticides and the Corrosion Groups of the Society of Chemical Industry in London that no single material will satisfy all requirements and that cost is an all-important consideration. Glass and platinum, for instance, are both suitable all-purpose materials, but the first is not sufficiently durable and the second, of course, is too costly.

Mr. R. J. Courshee, of the N.I.A.E., who gave the address, laid stress on the question of the cost of replacement and the serious effect of a delay in a spraying programme due to a breakdown. The small man wants a sprayer which will handle all the chemicals he needs to apply; it must have a long life and be reliable and cheap – an impossible combination. The spraying contractor can afford to own several costly machines of different types to meet all requirements and to deal with a very large acreage and to buy new machines at regular intervals, thus avoiding the possibility of serious failures.

Mr. Courshee considered in turn the standard materials – copper, brass, stainless steel, mild steel, aluminium and galvanised iron. Brass appears to be suitable for most chemicals, but for non-corrosive materials galvanised iron is both cheap and satisfactory. It is all a question of the price and the special requirements. Of the latest materials of construction, polythene appears to be superior to PVC, nylon and fibreglass, though each has its special uses. Even polythene has its limitations, however – it will resist all the known agricultural chemicals but not cresolic liquors and vitriol. If however, there is polythene all the way from the liquid container to the jet, a sprayer in which this material is incorporated can be used for most purposes.

Thus a stage has been reached when it will be necessary to define not only the specific agricultural uses of a new agricultural chemical, but also the correct materials of construction for the machine used to apply it, so that there will be the minimum of scaling and blockage of jets and the least amount of corrosion and mechanical erosion with, at the same time, no risk of accident due to explosion or leakage. The N.I.A.E. can indeed render a valuable service to the manufacturers of spraying and dusting machinery by systematically testing and reporting on every new agricultural chemical as soon as it appears.

Shifting cultivation

SHIFTING CULTIVATION is practised largely in the humid tropical lands, often in the hills. The forest or grass woodland is hacked down and burnt, crops are grown, and within a year or two, when the intense heat and rain have impoverished the exposed soil, the clearing is abandoned and a fresh one opened up. If the abandoned area is on a slope, soil erosion quickly sets in and flooding of the lowland valleys is inevitable.

This type of cropping cannot be harnessed to organised agriculture, nor can long-term improvements be undertaken; neither does it allow a concentration of population with its resultant social progress, since crop yields remain only at a subsistence level. It corresponds to conditions in the late stone age of the Neolithic Period of mankind, between the years 13000 and 3000 B.C. It has been estimated that today perhaps 200 million people, occupying 14 million sq. miles of the earth (9,000 million acres), are still following this wasteful and backward form of agriculture.

One factor that causes a man to move on in the wet tropics is the rapid deterioration of exposed soil. ' Humus disappears like snow before the tropical sun ' it has been said by a well-known soil scientist. In India the nitrogen content of a jungle soil may well be halved one year after exposure. In the Ganges Valley, forest soil contains up to 0.1% of nitrogen, but cultivated soil has a value of about 0.04% only. No doubt before the pressure of population in the Ganges Valley made it impracticable, shifting cultivation was the order, but when conditions fixed the boundaries of communities, liberal fallows were first employed to meet the challenge of soil deterioration. Today, fallows are necessarily reduced or even omitted altogether.

In Malaya, observation has shown that the nitrogen content of a soil may fall from% 0.17 to 0.11% after 11 weeks' exposure to sun and rain. At high elevations in the tropics, say, about 5,000 ft., the nitrogen content of a forest soil may be double that found in the plains, but such exposure soon reduces it to about half the original figure.

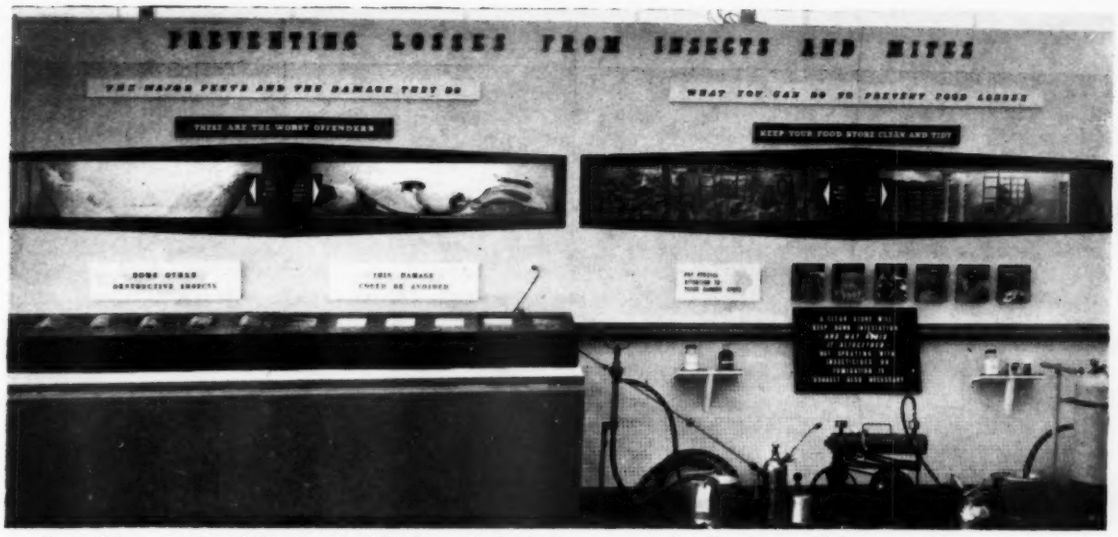
In and around the Assam Valley of North-East India, the effects of shifting cultivation are woefully apparent. Thus, in the Dooars tea area, planted near the southern foothills of the Bhutan Himalayas in which the hill population is rapidly increasing, the nearby mountains present an ugly patchwork of landslide, secondary jungle, slap-dash cultivation and diminishing areas of primeval jungle. Planters speak of forest streams, that, as young men, they could jump across (this is probably a post-prandial hyperbole), which are now straths of sand up to half-a-mile wide, practically devoid of water except when filled with a raging torrent following each downpour. The consequent damage caused to plains cultivation by flood can thus be understood.

In the Naga Hills, to the south of the Assam Valley, and on into the Irrawaddy Valley, shifting cultivation is known as *jhum*, and it is surprising how much of the original jungle has been cleared in these scrub-covered hills. The same holds for the hills of much of Upper Burma and Upper Siam. It is of interest here to record that in Siam, evidence is available to show that once the forest of a considerable area is cut down and left, it takes about 250 years for nature to re-establish a stand of the original composition.

Africa suffers likewise from shifting cultivation and some idea of its effects on a once fertile soil is seen at Chirinda, in the Melsetter district of Southern Rhodesia. Here an area of 1,200 acres of primeval jungle is preserved, and it is seen to be as dense as any in Upper Assam or on the Western Ghats of Southern India, with impenetrable undergrowth and enormous trees festooned with lianas. The tallest tree, 216 ft. high and 51 ft. in girth, is a protected national monument. This small area is believed to be the remains of a vast forest which once extended into Tanganyika. Today, this country is largely scrub and bush, hacked about by all and sundry for firewood, or used for occasional grazing or some catch cropping.

The grim story of shifting cultivation is not confined to Asia and Africa. The plains of the Middle West of America were used in this manner until comparatively recently. When first opened up, the prairie lands often gave as much as 40 bushels of wheat per acre, but monoculture and fierce summer heat did the same in the Middle West as in Mesopotamia, the mythical Garden of Eden, and the yield soon fell to under 10 bushels per acre, in the much-publicised 'dust-bowl'.

The problem has two distinct aspects, the social and that of correct soil management. If land is available, the average, simple man will move on when necessary, preferring his liberty to living in a settled community, but, sooner or later, even the most primitive peoples will be forced, by reason of their fecundity, to settle down and face the problem of soil deterioration. The subject has been referred to in *Unasylva*, No. 1 of 1957, and FAO has called for special attention to be given to this matter for, unless the problem is solved, the mass of the people living in the tropics will remain poor.



One of four static exhibits by the Ministry of Agriculture, some details about which are given on page 164

War on Pests

WORLD CROPS' Crop Protection and Pest Control Exhibition

IN the armoury of the weapons of the war on pests there are repellents to use against destructive animals and attractants to trap insects and pesticides to destroy them. There are electric fences to keep out marauding animals, detonating scarers to drive away birds, and traps to catch vermin. There are rodenticides and pesticides for industrial and domestic use; fumigants for the protection of stored products, disinfectants for all manner of purposes, and preservatives for keeping destructive boring beetles away from cut timber. Competing weeds, which materially reduce yields of crops, may be destroyed by a whole host of selective and total weedkillers. Soils may be sterilised or cleared of weeds by the new technique of flame-gunning, and glasshouses, estate stores and storage go-downs may be fumigated to rid them of destructive pests and diseases. There are today dressings for valuable selected seed, which will not only repel consuming insects while it is in store, but will later protect the young seedlings against the destructive eelworms and other hostile soil organisms. So the war on pests goes on – attacking on all fronts.

The chemicals, machines and equipment now available to the farmer, planter, horticulturist, storage expert and public health official in their battle against these pests will be on show at the *First International Crop Protection and Pest Control Exhibition*. Organised by WORLD CROPS, the Exhibition will run for four days–12 to 15 May — at the Royal Horticultural Society's New Hall, Greycoat Street, Westminster, London.

The Exhibition will be opened officially at 3 p.m. on Monday, 12 May, by the Right Hon. Tom Williams, P.C., LL.D., M.P., Minister of Agriculture for six years until 1951.

The following is a list of some of the exhibitors, together with a brief account of their exhibits:

EXHIBITION GUIDE

AAgrunol Chemical Works Ltd. This Dutch firm will stage an exhibit based on their pesticides, including fungicides, insecticides, weedkillers and seed dressing chemicals.

African Pyrethrum Technical Information Centre Ltd. The Pyrethrum Boards of Kenya and Tanganyika and the Société Co-operative des Produits Agricoles of the Belgian Congo have co-operated in the provision of an African Pyrethrum Technical Information Centre exhibit which will illustrate the story of pyrethrum from the growing of the flower (which has been used for more than 2,000 years in the control of insects) to the varied use of insecticides based on it.

Agricola Plant Protecting Chemicals Ltd. The main feature of the Agricola exhibit will be the Agricola electroduster, of which two models will be shown: the ' Baby ' Mk. IV, a two-men apparatus designed so that it can also be mounted on transport, and the ' Papoose ' knapsack type machine. The Agricola electroduster imparts a positive electrostatic charge to the dust on ejection, thus precipitating the dust on all sides of the plant and, because the plant is negative, achieving a very high degree of adherence.

E. Allman & Co. Ltd. exhibits will include: the ' Sprayall 100 ' high/low-volume tractor-mounted general-purpose sprayer, the ' Model 30 ' portable sprayer, the ' Speedispray ' low- or medium/low-volume sprayer tractor mounted for all 3-point linkages, the ' Handop ' hand-operated dusting ma-

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Photo: Lawson and Co.

Mr. W. G. Norris, Managing Director of the Leonard Hill Technical Group, presiding over the Exhibition Press Conference held at the Waldorf Hotel, London, on 31 March. On his right is Mr. F. C. Cooke, Editor, and on his left, Mr. W. H. Bell, Manager, WORLD CROPS, and Organiser of the Exhibition

chine, and various sprayer components and accessories.

Atlas Copco (Great Britain) Ltd. will display a range of compressed-air equipment developed for the application of aerosols and other liquid agricultural products; a range of electrical and petrol-driven compressors with specially matched spray guns and containers for different types of materials; and the Atlas Copco moisture sprayer for the automatic control of humidity in greenhouses.

A. B. Blanch & Co. Ltd. The Blanch ' Banger ' bird scarer, effective also in the protection of crops against vermin and wild animals, is being exhibited.

Brinkhoff & Jahn Ltd., a Swiss firm, in conjunction with their U.K. representatives, M. Fulder & Co. Ltd., will be exhibiting, amongst other equipment, the ' Stroco ' hand-operated rotary powder duster, the ' Friulana ' and ' Super Friulana ' knapsack sprayers, and the ' Folgore ' interchangeable knapsack/wheelbarrow sprayer or duster.

The *British Ratin Group of Companies* will be exhibiting the products and services of the five member companies dealing with crop protection and pest control: The Mi-Dox Company (marketing the R.S.M. mobile sprayer), Rentokil Ltd. (products for woodworm and termite extermination), Woodworm and Dry Rot Control Ltd. (timber treatment services), Disinfestation Ltd. (insect and rodent control services) and Fumigation Services Ltd. (food store fumigation).

The *British Wood Preserving Association* exhibit will deal with the insects and fungi which attack timber, and with the three main types of wood preservatives and their principal uses and methods of application. Information will be given on the spraying of newly-felled timber overseas against ambrosia beetle attack.

Chase Protected Cultivation Ltd. This exhibit will feature ' Sea-Magic', a new leaf spray, pest deterrent and plant food; cloches; and trickle irrigation.

Church Road Motors (Southend-on-Sea) Ltd. World concessionaires for the EXID ' Thunderbird ' cannon, Church Road Motors (Southend-on-Sea) Ltd. will be showing several of their bird and pest scarers and a sectional model to demonstrate construction and operational working.

The *Colonial Pesticides Research Committee* will stage a display illustrating some of the work of their research stations at Arusha in Tanganyika and Porton, Wiltshire, where fundamental research is carried out on insecticides, fungicides and herbicides.

The Commonwealth Agricultural Bureaux. This organisation – consisting of the Institute of Entomology, the Mycological Institute, the Institute of Biological Control and the ten Bureaux of Animal Breeding and Genetics, Animal Health, Animal Nutrition, Dairy Science and Technology, Forestry, Helminthology, Horticulture and Plantation Crops, Pastures and Field Crops, Plant Breeding and Genetics, and Soils – will stage an exhibit which will include specimen copies of the Bureaux' abstract journals and of all other recent publications. The Institutes and Bureaux act as effective clearing houses of information for scientists and research workers in agriculture, animal health and forestry throughout the Commonwealth and, increasingly, throughout the world.

Cooper, Pegler & Co. Ltd. will be exhibiting a full range of spraying and dusting machinery for growers of large and small crops of every type. The range will include hand-operated machines, knapsack sprayers, high-pressure power sprayers and a variety of dusting apparatus. The ' Mapic ' D_2T soil steriliser will also be shown.

Crown Pump Manufacturing Co. Ltd. will be exhibiting their rotary vane ' V '-type agricultural insecticide spraying pumps with p.t.-o. coupling; rotary gear 'A'-type agricultural spraying pumps; crop spraying equipment accessories; water pumps and centrifugal pumps suitable for irrigation, high - pressure washing - down and general duties.

The *D.S.I.R.* stand will highlight three main groups of research work currently going on at the Pest Infestation Laboratory—storage, biology and control—and will include several actual examples of infestation. The Laboratory's main theme is that prevention is better than cure. The threat of insect infestation to previously uncontaminated stored foodstuffs can be greatly reduced by the proper design of

buildings, by orderly stacking and by good hygiene.

A grain moisture meter developed at the Laboratory and now commercially produced, which has the advantage of simplicity and speed, will be on view.

The Dorman Sprayer Co. Ltd. Centre of attraction will be the Dorman ultra-low-pressure system of no-drift spraying, which, it is claimed, virtually eliminates danger to neighbouring crops through wind drift. Equipment on display will include the Dorman wheelbarrow orchard sprayer, the high-pressure mobile pump unit, the Dorman 60-gal. standard and utility sprayers, a 40-gal. sprayer, the Dorman 'Osprey' knapsack sprayer, and examples of nozzles and booms manufactured by the company.

The Eclipse Spraying Co. Ltd. will be exhibiting the Eclipse range of hand-operated spraying outfits and accessories for agricultural and horticultural purposes, hygienic and anti-malarial spraying.

Exhibition Bookshop. The Exhibition Bookshop will display many books on agriculture and crop protection published by Leonard Hill (Books) Ltd. and other well-known publishers. Visitors to the stand will have the opportunity of securing advance information on two important new series of books on major world crops and ancillary subjects: WORLD CROPS Books and Plant Science Monographs, the first titles of which will appear towards the end of 1958.

FOR YOUR DIARY

Place

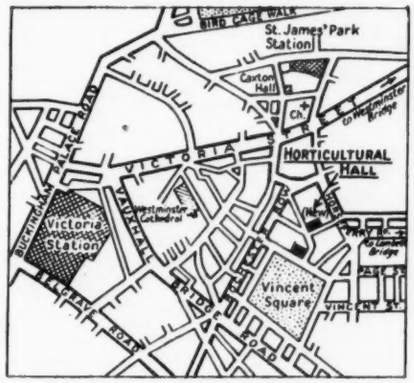
Royal Horticultural Society's New Hall, Greycoat Street, Westminster, London, S.W.1

Official Opening

3 p.m., Monday, 12 May, by the Rt. Hon. Tom Williams, P.C., LL.D., M.P.

Times

Monday	12 May, 10.30 a.m.–6 p.m.
Tuesday	13 May, 10.00 a.m.–6 p.m.
Wednesday	14 May, 10.00 a.m.–6 p.m.
Thursday	15 May, 10.00 a.m.–5 p.m.



How to get there

Nearest Underground Stations: St. James's Park and Victoria

Bus routes: 11, 24, 29, 39, 46, 76, 134

The Four Oaks Spraying Machine Co. Ltd. Prominent in this display will be the 25-gal. capacity 'Spraymobile' self-propelled sprayer, a most versatile machine. Also on show will be 6- and 15-gal. mechanised sprayers and 'Four Oaks' knapsack sprayers.

W. T. French & Son Ltd. On show for the first time will be a new range of manually-operated pneumatic sprayers, known as the 'W' range, the design of which is based on the specification laid down by WHO. Also displayed by this exhibitor will be a wide range of pneumatic sprayers, a battery spraying outfit, knapsack sprayers, sprayers of stirrup pump design and hand sprayers.

Gennar Ltd. will be displaying their 'Mini-Compressor' and accessories, which are a new addition to the range of spraying equipment on the market. The exhibit will highlight the elimination of laborious hand pressurising and the fine control which can be exercised on the spray output from the Gennar 'TJ' canisters.

C. F. Gerhardt Ltd. This company will be exhibiting the 'Dethmor Warfarin', 'Dethmor Plusbait' and Sewarin rodenticides; 'Wormex' for the treatment of worms in pigs, poultry and horses; and 'Thram' for the prevention of feather pecking and cannibalism in poultry.

Hill-Barnes (Pumps) Ltd. will be exhibiting a new range of self-priming pumps which are being made under licence to the design of the Barnes Manufacturing Company, U.S.A.

Kent Engineering & Foundry Ltd. will be showing their shoulder-mounted 'Motoblo' mistblower and combined mistblower and duster, and their tractor-powered 'Conomist' mistblower.

Kestrel Engineering Co. Ltd. will be exhibiting their power-operated dusting and spraying machines, knapsack sprayers, knapsack dusting machines, and telescopic lances and sprayer accessories.

Kiekens Whirlwind (London) Ltd. will show in their exhibit the complete range of Kiekens Whirlwind low-volume shoulder-mounted mist and powder blowers, designed for use in

Photo: Lawson and Co.

Part of the gathering at the Press Conference to introduce the Exhibition

orchards, nurseries, under glass and in tea, cotton, tobacco, coffee, citrus and banana plantations.

Charles P. Kinnell & Co. Ltd. Illustrating the importance of irrigation in crop protection, Charles P. Kinnell & Co. Ltd. will be exhibiting oscillating and hand-controlled portable quick-coupling spray lines for watering market gardens, glasshouse crops and pastureland; oscillator-nutrient pumps for injection of saturated solutions of chemical fertiliser into spray lines; rotary spray heads for use with portable mains to water fruit orchards, market gardens, farm crops and pastures; and irrigation pumps.

Leek Chemicals Ltd. will stage a display of the selective weedkillers of Sir T. & A. Wardle Ltd. – CMPP, MCPA, DNOC, 2,4-D and DDT.

Lunevale Products Ltd. will feature insecticides, fungicides, seed dressings, etc.

Metallurgical Chemists Ltd. The exhibit of this firm, which specialises in custom formulating and private brand work, will deal with the following amongst other products: copper oxychloride in various formulations, cuprous oxide, Agricola electrodusts, Zineb, Coxyzin (based on copper oxychloride and Zineb), MCPA, 2,4-D, 2,4,5-T, sodium (potassium) arsenite, lead arsenate, malathion, lindane, aldrin, dieldrin and DDT.

Micron Sprayers Ltd. will show their latest machine, the 'Micron Twin', for the first time at an international exhibition. This is a concentrate sprayer which has been designed at the request of fruit, hop, vine and coffee growers, who require a very powerful automatic sprayer which can be attached to the hydraulic lift of a tractor and driven by the p.t.-o. Also exhibited will be the lightweight trolley-mounted version of the 'Micronette' sprayer.

Ministry of Agriculture, Fisheries and Food. In addition to a bookstall at which there will be available a comprehensive range of the Ministry's publications, particularly those relating to pests and their control, the Ministry of Agriculture, Fisheries and Food will provide four static exhibits.

In the first of these the extent of damage caused by insects to several types of grain and foodstuffs will be seen. Specimens will show where grain has been nibbled, bored and made unsaleable. In the exhibit on hygiene in grain storage, replicas of the interiors of storage plants will be shown, with infestation danger spots pinpointed, and routine precautions indicated. The third exhibit will also show specimens of insects that attack stored grain and the damage they do, as well as recommended preventive measures and treatment. The fourth exhibit will deal with rabbit control and the new humane traps which have recently been approved will be displayed.

Reader Service

Readers may obtain further information on the products of any specified exhibitor by applying to:

Reader Service,
WORLD CROPS,
Leonard Hill House,
Eden Street, London, N.W.1,
England

Pechiney-Progil S.A. This French firm will be exhibiting its range of crop protection and pest control chemicals, including 'Cuprosan', a fungicide for the treatment of vine mildew, potato blight and sugar-beet cercosporiose, and 'Herbogil' creme, a weedkiller for use in cereals and alfalfa.

Edgar Percival Aircraft Ltd. The interesting exhibit to be staged by this firm will include a model of the EP.9 agricultural aircraft, EP.9 spray booms complete with nozzles, propeller-driven pump, operating valve and other components of the aircraft.

N. V. Philips-Roxane Pharm.-Chem. Ind. 'Duphar'. The exhibit of the Netherlands firm of Philips-Roxane will deal with their 'Tedion V-18' acaricide, 'Duphar' colloidal copper, BHC, lindane and 2,4,5-T acid.

Protim Ltd. will feature Protim wood preservative for the pre-treatment of new timber; the Protim *in situ* eradication service; fungicidal plugs; and the 'Protimeter' electric moisture meter.

W. G. Pye & Co. Ltd. will be exhibiting a selection of their pH Meters, the Automatic Titrator, the Conductivity Meter 'W', the 'Milcometer' and various laboratory instruments.

Ratsouris Ltd. The Ratsouris exhibit will include RIS rodenticides containing warfarin and RIS insecticides based on lindane, dieldrin and malathion.

The exhibit of *Solo Sprayers Ltd.* will include hand sprayers, knapsack sprayers, suction and bucket pumps, limewashing pumps and lawn sprinklers.

The Standardised Disinfectants Co. Ltd. will provide exhibits illustrating the variety and world-wide scope of their products, which include livestock dips and sprays; timber insecticides and wood preservatives; insecticides for public health, stored products and agricultural requirements; chemicals for use on rubber and other tropical plantations; carbolic and pine disinfectants; and materials specially formulated for spraying contractors using both ground and aerial application.

The Vigzol Oil Co. Ltd. Two models of the 'Blitzweed' ground-crop spraying machine – one for medium-volume applications and the other for low-volume applications – will be shown on this stand. Also exhibited by this company will be a wide range of agricultural chemicals suitable for application by spraying, including 'Blitzweed Super' (MCPA), 'Blitzcleve' (CMPP), 'Leykleen' (MCPB), 'Turfspray' (2,4-D), 'Banpest' (DDT emulsion), 'Blitspor' (copper oxychloride), 'Razetops' and 'Naturfeed'.

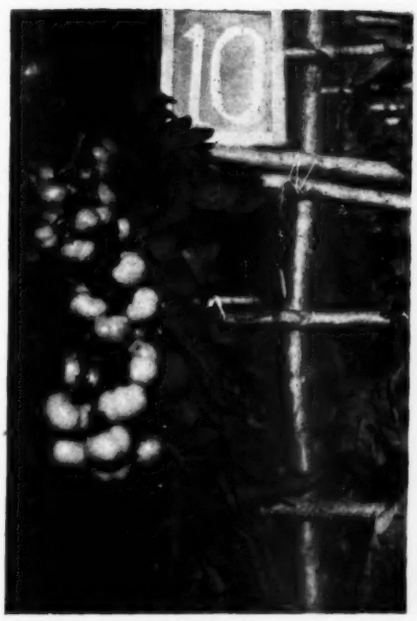
WAECO Ltd. (*Fumite Division*). will be exhibiting the full range of 'Fumite' insecticidal and fungicidal smoke pellets and generators, which will be of particular interest to tobacco growers and manufacturers, farmers and horticulturists, ship and food warehouse operators and public health authorities.

E. J. Woodman & Sons (Pinner) Ltd. Horticultural sundriesmen and manufacturers of various horticultural requisites, E. J. Woodman & Sons (Pinner) Ltd. will stage a wide and varied display, including their specialities in garden labels and whalebone besoms.

Commercial Tomato Growing in the West Indies

J. S. CAMPBELL, B.SC., D.T.A.
(*Imperial College of Tropical Agriculture*)

The tomato, the most important vegetable grown in the Caribbean area, is mainly produced by small growers cultivating from one-half to three acres and is planted principally during the months October to April, when the lower rainfall, humidity and night temperatures provide more suitable conditions for the crop than at other times of the year. This period corresponds with the most difficult time to produce tomatoes on the North American continent and has, therefore, led to a considerable trade between the two areas.



Tomato growing in Montserrat, showing the method of staking necessary to avoid fruit rots

BEFORE the second world war there was a large trade (Table 1) in fresh and canned fruit between Cuba and the U.S.A., Canada and Panama. In the U.S.A. most of the tomatoes for the winter and spring markets were and are still grown in the southern states. They are supplemented from December to February by shipments from Cuba and Mexico. Tomatoes are produced under greenhouse conditions in the northern and eastern states at this period, but, in the face of competition from cheap field-grown fruit that can be shipped safely, their production has diminished in favour of more profitable crops.

Prior to the war there was also a small trade in fresh tomatoes between Canada and the British West Indian Islands, Jamaica, Montserrat, St. Kitts-Nevis, St. Vincent, and also the Bahamas and Bermuda (Table 1). This trade was dependent on shipping facilities provided by the Canadian National Steamships and helped to boost the economy of many of the smaller islands, such as Montserrat, very markedly.

During the second world war trade in the area was much reduced, but again revived once the war was over. The pattern of fresh fruit export during the past 10 years has, however, differed from that of the pre-war period. There has been a vastly increased acreage and production of winter and early spring tomatoes in Florida, which has made it more difficult to market fresh produce from the islands of the Northern Caribbean to the U.S.A. and has led to a decline in production for export, particularly from Cuba. Cuba is still, however, the largest exporter in the area and, like Jamaica and the Bahamas, supplies the American market, shipping either

Table 1
Quantity and value of exports of fresh fruit, tomato juice and canned tomatoes (1938 and 1954) from the West Indies
(Quantities in metric tons. Value in thousands of $U.S.)

Country	*Fresh fruit*				*Tomato juice*				*Canned tomatoes*			
	1938		1954		1938		1954		1938		1954	
	Quantity	*Value*	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
Cuba	21,289.3	6,774	4,534.8	2,389	—	—	4.5	15	77	47	0.6	1
Dominican Republic ..	—	—	100.9	83	—	—	—	—	—	—	—	—
Jamaica ..	—	111	808.6	302	—	—	151.7	255	—	—	32.7	113
Montserrat ..	—	273	34.6	53	—	—	—	—	—	—	—	—
St. Vincent ..	17.3	20	—	—	—	—	—	—	—	—	—	—
Antigua, St. St. Kitts, Nevis ..	29.0	39	—	—	—	—	—	—	—	—	—	—

An irrigated market garden in Barbados. Note the wind-actuated water pump and the spraylines

by air or sea, mainly through Florida. The trade between the British West Indian Islands and Canada has stopped due to the cessation of adequate and regular shipping. Montserrat is now trying to build up its trade, with what shipping is available, to such places in the Eastern Caribbean as Trinidad and British Guiana.

Processed tomato products, such as juice and canned fruit, are produced in Jamaica and Cuba only for export — Jamaica exporting mostly to the U.K.

There is, however, a very large import of tomato juice and canned fruit into the area, particularly to Cuba and Puerto Rico (Table 2). ***These products come very largely from the U.S.A. and there is, therefore, a considerable potential domestic market for local production.*** At the moment cost of local production of the fruit in the field is greater than it is in the U.S.A. and it is at present cheaper to import the foreign products.

Varieties

Because of the specific demands of the North American fresh fruit trade, the main varieties grown have been of American origin. Fulfilling those demands and at the same time yielding well under tropical conditions, the variety ' Marglobe ' has been, and still is, the principal variety grown. This variety travels well in cool storage and ripens in firm condition on arrival. Improved strains of this variety are also now being grown.

The old varieties will in the end have to give way to newer ones superior in one or more respects. ' Grothen's Globe ', the principal variety grown in Florida at the present time, and ' Rutger's ', a selection out of ' Marglobe ' and one of the most important varieties grown in the whole of the U.S.A., are now the principal varieties grown in the Bahamas. Recent trials in Florida with ' Manalucie ', a variety selected by the Florida Agricultural Experiment Station in 1953, indicate that it will out-yield most of the standard varieties and produce a larger fruit with good shipping qualities. This variety has done extremely well in Puerto Rico and would justify further trials elsewhere in the Caribbean area.

Other American varieties which are still commonly grown in the area, particularly for garden cultivation, include ' Bonny Best ', ' Oxheart ', ' Ponderosa ' and ' Earliana '. Very little seed of English origin is planted. Hybrid American varieties have been tried out with some success on a small scale, but have not been grown on a commercial scale, possibly due to the high cost of the original seed. On the other hand, except for a few varieties selected in Puerto Rico, there has been little local selection of tomatoes.

It is perhaps interesting to note that all those mentioned are staked, indeterminate varieties. The unstaked,

Table 2
Quantity and value of imports of tomato juice into the West Indies, 1954
(Quantities in metric tons. Value in thousands of $U.S.)

Country	*Tomato juice*		*Canned tomatoes*	
	Quantity	*Value*	*Quantity*	*Value*
Cuba	5,294.6	11,251	135.8	328
Puerto Rico	4,791.5	11,414	748.8	1,316
Netherlands Antilles ..	—	—	385.0	896
British Guiana	—	—	38.9	114
Jamaica	3.6	19	7.0	31
Trinidad and Tobago ..	—	—	49.5	161
U.S. Virgin Islands ..	40.5	99	—	—

Table 3
Acreage and yields (long tons) of tomatoes in various countries

Country	*Type*	*Acreage*	*Yield per acre*
U.K.*	Glasshouse – Fresh market	2,903	34.8
	Field	926	12.8
U.S.A.†	Field: Fresh market	234,930	14.0
	Field processing	320,800	0.91
Puerto Rico ..	Field: Fresh market	2,500	$2\frac{1}{2}$–3
Trinidad	,, ,, ,,	1,000	2–3
Montserrat	,, ,, ,,	75	2–$2\frac{1}{2}$
Bermuda	,, ,, ,,	45	4
Bahamas	,, ,, ,,	1,500	$4\frac{1}{2}$–5

* Agricultural Statistics, Ministry of Agriculture, Fisheries and Food
† Bureau of Agricultural Economics, U.S.D.A.

determinate or bush varieties have not been grown to any great extent, except in Barbados, where ' Bounty ' is principally grown. Newer determinate varieties, such as those selected in Hawaii,[1] which have been tried out in Trinidad with success, might be of particular value in the area.

Seedling production

All tomatoes are grown in the field. Seedlings for commercial purposes are produced on slightly raised, well-prepared seedbeds about 2½ ft. to 3 ft. in width, in the open. A small amount of fertiliser or farmyard manure is often added and the seed is either broadcast or thickly sown in shallow drills a few inches apart across the bed. Coconut palm leaves or grass may be placed on the bed for protection from sun or birds during the first few days, but this is removed when the seed germinates. No further top shade is given thereafter. Due to this heavy seed rate, very poor plants are generally produced and this constitutes one of the limiting factors to successful tomato growing.

In Puerto Rico[2] and Trinidad[3] it has been shown that the quality of the seedling transplanted has a direct effect not only on the early and the total yield of fruit, but also on the number of replacements necessary. One of the chief factors governing success in transplanting is the availability of water to the plant, which largely depends upon the extent of its root system.[4] This in turn is dependent on the care and attention given to the production of the seedling and in its subsequent transplanting. Small growers take little care and transplant seedlings generally without soil or roots. On the other hand, stronger plants with good root systems can be produced in pots or boxes or even from open seedbeds if the seedlings therein are thinned to a spacing of 3–6 in. each way. The nursery stage makes or mars a good crop and, furthermore, there is no doubt that the growth from the sowing of seed to the production of the crop should be continuous and have no setbacks.

Transplanting

Seedlings are transplanted into the field when they are 5–6 in. high. Spacing varies from place to place, but is about 18–24 in. in the row with the rows 3–4 ft. apart. Closer spacing is associated with staked tomatoes and wider spacing with unstaked, very wide spacing being used where weeding is mechanised. The seedlings themselves may be transplanted on the flat and later moulded up two or three times, as in Trinidad, or planted on the ridge, as in Montserrat.

Manuring

The use of farmyard manure is limited; in Trinidad a small amount is generally given to each plant at, or soon after, transplanting. Fertiliser use, particularly by peasant growers, is small and this considerably reduces yields. It has been calculated in the U.S.A. that a 10-ton crop of tomatoes absorbs from the soil approximately 100 lb. of nitrogen, 35 lb. of phosphoric acid and 200 lb. of potash, as well as other minerals, such as calcium and magnesium. About half of these plant foods are required by the fruits and the remainder by the vines.

Depending on the fertility and type of soil, general recommendations from various sources indicate that an application of a mixed fertiliser (3:4:3 or 1:2:2) at the rate of 750–1,000 lb. per acre, and even up to 2,000 lb. per acre, is necessary for a good crop. This fertiliser should be applied so that plant nutrients are available throughout the entire season. Hester[5] in the U.S.A. has shown that nitrogen and potash are particularly required in the second and third months after transplanting. Under tropical conditions this requirement occurs somewhat sooner. Hence it is advisable to apply one-third to one-half of the fertiliser mixture either about 10 days before or at transplanting and the remainder in one or two applications after the plants have become established.

Organic by-products in the Caribbean, such as filter press cake from the sugar factories, have been shown to be useful in Puerto Rico,[6] and cotton seed meal is used in Montserrat.

Some damage to the roots of a seedbed-produced plant is inevitable. The idea of applying a solution of soluble plant nutrients or a ' starter ' solution to enable the plant to withstand the shock of transplanting and so become established more quickly came into prominence in the U.S.A., where mechanical transplanters capable of injecting water into the planting hole at transplanting time are now used. Not only has their use enabled the plant to grow more quickly, but early and total yields are increased. This has been confirmed in Trinidad,[3] where the addition of ¼ pint of a solution containing 5 lb. of a mixture of ammonium phosphate, two parts by weight, and potassium nitrate, one part by weight, in 50 gal. of water at transplanting time is advocated.

Staking and pruning

The question of staking versus non-staking and of pruning versus non-pruning indeterminate varieties of tomato is a controversial one. In Puerto Rico, Riollano,[7] comparing staking, non-staking, pruning and non-pruning with the variety ' Marglobe ' at a spacing of 4 ft. × 2½ ft., has shown conclusively that pruning and staking tomato plants reduces considerably the yields of both the marketable and the

A 'Saval' knapsack sprayer being used on non-staked, non-pruned tomatoes

(Right) *Tomato plants being mounded after farmyard manure has been applied*

Staked tomatoes being irrigated by an overhead irrigation system supplied by the Aluminium Company of Canada Ltd., with sprinklers by the Rainbird Sprinkle Manufacturing Corporation of the U.S.A.

total amount of fruit. Furthermore, pruning and staking had no favourable effects on the size of fruit or earliness of production. Experiments in Trinidad appear to support these views. In South Africa, Styrdom[8] has shown that pruning not only reduces yield in staked tomatoes from spacings of 4 ft. × 2 ft. up to 5 ft. × 1 ft., but it also retarded ripening and did not produce an earlier crop.

It is arguable that more plants per acre can be planted when staking is practised, and hence higher yields can be obtained. To offset this there is the additional cost of production of those plants and their planting out, and the extra cost of staking and tying.

Pruning is particularly necessary in countries where tomatoes are grown under glass or where the sky is overcast for long periods. Under most tropical conditions there is an excess of sunshine and pruning is not justified. Furthermore, by pruning the speedy spread of virus diseases, particularly mosaic – all too common in the tropics – is accelerated.

In the West Indian areas, particularly in the Bahamas, Trinidad and Puerto Rico, staking and pruning of indeterminate varieties is not usually practised. In Jamaica both staking and pruning are advised by the Department of Agriculture, but there, as in Montserrat, there is potential trouble from fruit rots, which occur under wet conditions. The fungi attack any or all of the tomatoes that come into contact with the soil or those which become spattered with soil during heavy rains. By staking, the fruit is prevented from hanging near or touching the soil.

Pests and diseases

One of the principal reducers of crop yields in the Caribbean is the occurrence of foliage diseases. The most common include early blight, *Macrosporium solani*, grey leaf spot, *Stemphylium solani*, leaf mould, *Cladosporium fulvum*, late blight, *Phytophthora infestans* and septoria leaf spot, *Septoria lycospersici*. A regular spraying programme is essential, but, unfortunately, no one fungicide appears to be effective against them all. Weekly alternation of fungicides is probably desirable. The use of varieties tolerant to many leaf diseases, such as 'Manalucie' and the Hawaiian selections, is advocated. Obviously the long-term answer to the problem is the selection of varieties with high tolerance to all diseases.

Another limiting factor to production in many areas is the presence of bacterial wilt, *Pseudomonas solanacearum*, the incidence of which is aggravated because growers will persist in growing crops continuously on the same piece of land. Although this disease can be chemically controlled, it is probably not economic to do so, and again the selection of tolerant varieties is the answer to the problem. Another soil-borne disease, fusarium wilt, *Fusarium oxysporium*, is virtually controlled by the use of tolerant varieties. Mosaic virus and eelworm, a high incidence of which seems to be regarded as inevitable, do not seem to reduce yields greatly, so long as the plant is given good growing conditions.

The incidence of pests, on the other hand, though high, can be controlled reasonably satisfactorily with the newer insecticides, such as aldrin and dieldrin or malathion and parathion, applied at the appropriate time. Cutworms or mole crickets are particularly bad at planting out, whereas leaf miners, midges, stink bugs and caterpillars may be troublesome at various stages of the plant's life.

Yields

It is extremely difficult to obtain accurate figures of yields, since no agricultural statistics are available, and the figures for the West Indies, obtained from various sources (Table 3), are only estimates. It is perhaps interesting to compare these figures with those of the U.S.A. and the U.K. The figures for these two areas are taken from official statistics for 1955.

Packing and storage

In Jamaica each tomato is wrapped in soft tissue paper and packed in a wooden container, known as the 'standard tomato lug', which is guaranteed to contain not less than 30 lb. of fruit. This lug measures approximately 17½ in. × 14 in. × 7 in. (external) and is virtually the standard type of package for wrapped mature green tomatoes in Florida and is used exclusively in the Bahamas, Cuba, Jamaica and Montserrat. The packed fruit may then be stored in cool stores to await shipment or, if possible, shipped immediately. The ideal storage temperature is from 46°–48°F, at which the fruit will very slowly ripen and keep in good condition for at least 21 days.

In Jamaica, all products are handled and marketed through a large co-operative; in Montserrat, fruit is handled through a marketing agency; in the Bahamas, growers have their own packing houses, but these are licensed and supervised by Government inspectors.

Conclusion

Tomato growing is an ideal smallholder's crop. The standards of cultivation, however, of the small growers, who are the main producers in the West Indies, are low compared with those of many larger growers in the Bahamas and Puerto Rico. By the use of better varieties, improved cultivation techniques, increased use of mixed fertilisers and fungicidal sprayings, and better marketing arrangements coupled with improved shipping facilities, particularly in the Eastern Caribbean, the tomato industry could, and should, be a thriving one in the area.

REFERENCES

1. Frazier, W. A., Dennett, R. K., Hendrix, J. W., Poole, C. F., and Gilbert, J. S.: 'Seven New Tomatoes, Varieties Resistant to Spotted Wilt, Fusarium Wilt and Grey Leaf Spot', *Univ. of Hawaii Agric. Exp. Sta. Bull.* 1950, 103.
2. Work, P., and Amy, A. S.: 'Tomato Plant Growing Experiments in Puerto Rico', *Proc. Amer. Soc. hort. Sci.*, 1950, **56**, 266.
3. Campbell, J. S.: 'The Influence of Type of Transplant and the Effect of Starter Solution on the Yields of Tomatoes Grown Under Low Tropical Conditions', *Trop. Agriculture (Trin.)*, in press.
4. Loomis, W. E.: 'Studies in the Transplanting of Vegetable Plants', *Cornell Univ. Agric. Exp. Sta. Memoir*, 1924, 87.
5. Hester, J. B.: 'The Absorption of Nutrients by the Tomato Plant at Different Stages of Growth, *Proc. Amer. Soc. hort. Sci.*, 1938, **36**, 720.
6. Landrau, P., and Samuels, G.: 'Influence of Fertilisers on the Yield of the Plamar Variety of Tomatoes on a Coto Clay', *J. Agric. Univ. Puerto Rico*, 1955, **39**, 77.
7. Riollano, A.: 'The Effect of Staking and Pruning on Tomato Plants', *J. Agric. Univ. Puerto Rico*, 1943, **27**, 17.
8. Styrdom, E.: 'Is it Necessary to Prune Tomato Plants?' *Fmg. in S. Africa*, 1955, **30**, 349.

Horticulture in the Himalayas

F. B. CARBASIUS WEBER

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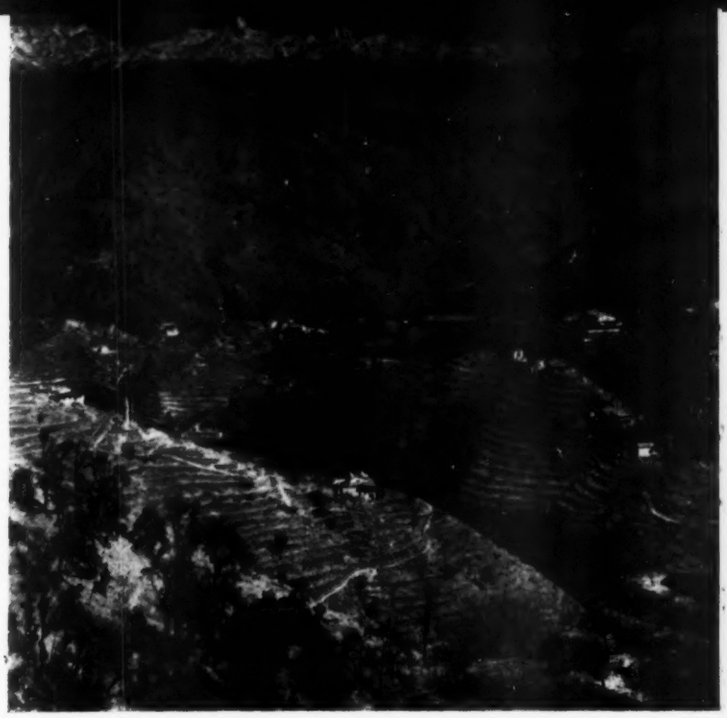


This is an account of the planned economic development of the fruit-growing industry in Uttar Pradesh, one of the constituent states of the Republic of India.*

THE State of Uttar Pradesh, in Northern India, is bordered by Nepal and Tibet in the north-east, by the Punjab in the north-west, by Rajputana and the Central Indian States in the south, and by Bihar in the south-east. The Himalayan districts of Naini Tal, Almora, Pauri and Tehri Garwal, with a population of two millions, cover 20,000 sq. miles of mountainous country, rising from the Ganges plains to the central Himalayan range to an altitude of 20,000 ft., from whence the plateau slopes down toward Tibet at an average altitude of some 10,000 ft.

Climate and flora

The climate of these districts ranges from tropical conditions in the valleys to sub-tropical and temperate at higher altitudes. Mangoes, bananas, guavas and jack-fruit are grown at the lower altitudes; higher up there are apricots, peaches, grapes, pomegranates and passion fruit; and higher still, apples, pears, cherries, plums, walnuts, chestnuts and hazelnuts in the temperate regions.

The soil is generally poor and shallow, but improves in quality and depth from the Nepalese border towards Himachal Pradesh in the north-west. Where the foothills are covered by natural 'chir-pine' forests, *Pinus longifolia*, the soil is extremely poor and lacking in humus, and where these forests fail, erosion sets in, aided by the severe over-grazing of these almost barren slopes, and in due course cactuses appear.

From 5,000 ft. upwards, there are oak forests and because of the scarcity of feed for animals, the leaves and twigs are chopped off and used as cattle fodder; it is not uncommon to see hungry livestock even feeding on pine needles.

Rhododendrons come in at about 6,000 ft.; at 8,000 ft. the pines give way to deodars, and at the tree-line, birches, *Betula utilis*, and rhododendrons struggle for survival.

The rainfall in the lower valleys is about 120 in., about 60 in. in the central ranges, and about 25 in. in the Indo-Tibetan borderlands, thus offering scope for the cultivation of a wide variety of crops – maize, wheat, paddy, soya-beans, local grains, millets and potatoes.

Plans and progress

In 1952, the Government of Uttar Pradesh requested FAO to assign an expert to advise on horticultural production, and following his preliminary survey, he advised the Government to link horticultural production with its industrial programme. The Government accepted these recommendations and approved the establishment of a Directorate of Fruit Utilisation.

The Indian Second Five-Year Plan envisages the rejuvenation of 500 thousand acres of existing orchards and the planting-up of some 200 thousand more, and additional modern fruit canning and packing factories are to be erected as production increases.

A total expenditure amounting to Rs. 3,366,000,000 is proposed for this State, of which Rs. 460,900,000 will be spent on rural development. During the period 1956–1961, the entire State is to be divided up into 'National Extension Blocks' (or groups of villages). Irrigation canals and tanks are now under construction and, in many areas, the people are giving assistance in labour, in cash, or in kind.

Development problems

The Directorate of Fruit Utilisation was established in May 1953 and among the problems claiming attention were the following:

1. The results of research at the Horticultural Research Station had to be interpreted to the public and applied in the field.

2. The growers had to be induced to form co-operative societies for the marketing of their fruit both to the

* Uttar Pradesh was formerly known as the United Provinces

Terraced orchards at Chaubattia, with peach trees in the foreground

packers as well as direct to the public.

3. The price of planting material and seed had to be reduced to bring them within the reach of the growers.

4. Small tools and equipment for home canning had to be made available at an acceptable price.

5. An extension service had to be organised to cover fruit production and fruit preservation, including practical demonstrations.

6. Technical assistance was needed to bring the existing fruit-packing industry up to date.

Extension services

The Directorate gave top priority to the establishment of the two extension services, as outlined above. The horticultural extension service started with one mobile unit in 1953, increased to four in 1954 and now consists of 17 mobile units of gardeners and plant protection officers, with added labour for field work when required. These teams, which are under the supervision of Senior Horticultural Inspectors, all received an intensive course of training at the Hill Fruit Research Station at Chaubattia in the Almora district.

The Chaubattia gardens were originally started in 1896. Today the research station consists of 139 acres of commercial orchard and 15 acres of model orchard, together with research areas and propagation nurseries – a total of 193 acres in all. Here the field officers are taught to recognise plant diseases and how to apply the necessary curative measures. They are also introduced to new working tools and taught correct cultural practices.

The second extension service similarly consisted of a number of mobile teams, each with an instructor in fruit preservation with some six assistants. These teams received their training at the Institute of Fruit Utilisation at Lucknow, and in addition the instructors attended the Central Food Technological Research Institute at Mysore.

A fruit processing plant has been established at Ramgarh in the hill district of Naini Tal, where there are 6,000 acres under apples, peaches, plums and pears and total production is of the order of 12,000 tons of fruit per season.

Horticultural branch

The preliminary survey had clearly shown how badly neglected these orchards in fact were. The peach groves were threatened with extinction through peach-curl aphis and diseased trees were actually being cut down. Most of them were covered with a thick growth of lichen and in places they were overgrown with secondary jungle. It was estimated that about 60% of the crop was being lost through hail damage, pests and diseases, and damage by birds, and also through careless methods of picking, handling, grading and packing.

Since the first mobile unit took the field in 1953, the whole of the 6,000 acres in the Ramgarh-Mukteshwar area has been rejuvenated. In the beginning, the growers were suspicious and were reluctant to co-operate; the mobile unit established demonstration plots of some 100 trees and showed what could be done and, following this, there was increasing co-operation. In the diseased peach plantations, DDT spray (0.25%) gave dramatic results and the dreaded peach leaf curl disease has been almost completely eradicated. In some gardens, there has been a tenfold increase in crop, while overall production rose from 1.2 million lb. in 1952 to 2.8 million lb. in 1956.

The magnitude of the task can be better appreciated by the following analysis of the orchards in the four hill districts of Uttar Pradesh, many small properties, some consisting of as little as one to ten trees, being spread over a wide area:

Table 1
Orchards Supervised by the Mobile Teams in 1956–57

Extent	*Number*
0.01 to 0.1 acres ..	409
0.1 ,, 0.5 ,, ..	790
0.6 ,, 1.0 ,, ..	293
1.0 ,, 5.0 ,, ..	767
5.0 ,, 10.0 ,, ..	239
10.0 ,, 50.0 ,, ..	161
50.0 ,, 100.0 ,, ..	7
100.0 acres and over ..	10
Not included	472
Total ..	3,148

Encouraged by this success, many new orchards are now being established and the nurseries are unable to cope with the demand for planting material.

New planting

A grand total of 982,867 trees has been planted in these hill districts since 1952, a clear indication that the people are responding favourably to the approach of the mobile units. An important task has been to bring the price of planting material down to a reasonable level. In 1947, the ruling price was Rs. 1/- per plant; by 1957, the price had been reduced to Rs. 0.30, with vastly increased production. Nowhere can budded or grafted plants be offered at such a low price. Up to 1956, the planting material was produced mostly at the Chaubattia nurseries, but since 1953, some 17 new

nurseries have been established and the following is the programme of past and future production:

Table 2
Supply of Planting Material

Period	*Already supplied*
1947–56 ..	200,000
1956–57 ..	400,000
	Future plans
1957–58 ..	412,000
1958–59 ..	575,000
1959–60 ..	860,000
1960–61 ..	930,000

Fruit processing branch

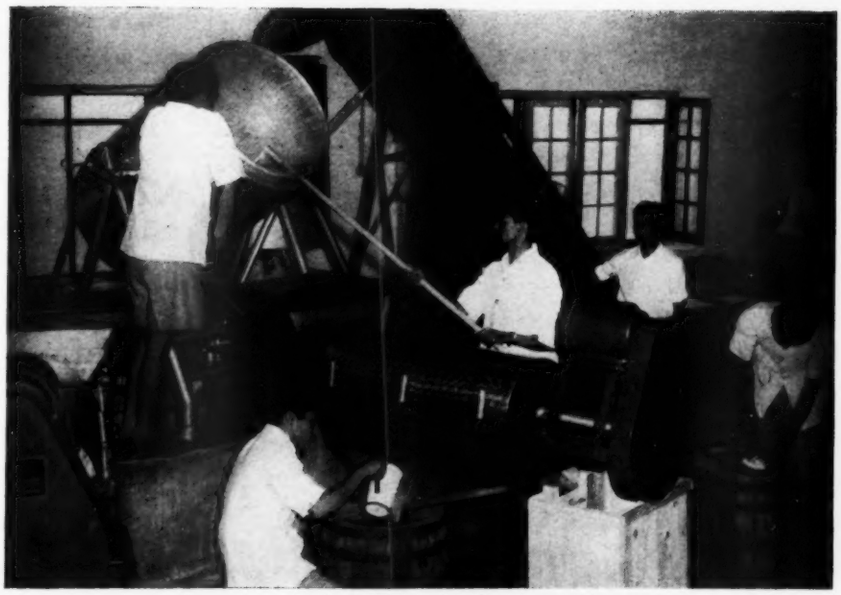
While this work was going ahead, plans were finalised and a modern fruit-processing pilot plant was established at Ramgarh, because so much of the fruit produced was going to waste. An entirely new approach was necessary to avoid bringing the products of this Government cannery into direct competition with the existing fruit-packing industry. This consisted of 64 factories, of which only five had a yearly output worth more than Rs. 100,000, but it was an expanding industry.

Furthermore Ramgarh is high up in the foothills of the Himalayas and the supply of cans would have been a costly operation. It was therefore decided to manufacture only fruit juice and pulps; the latter could be packed with sulphur dioxide as a preservative in barrels of local manufacture.

The fruits are sorted, washed, graded, and then blanched with steam to remove the skins and subsequently they are pulped. The pulp is allowed to cool and is then poured into the wax-lined barrels, while adding sulphur dioxide, so that the final concentration is slightly above 1,000 parts per million. Then the barrels are closed and rolled away to the store.

If the conditions of storage are sufficiently cool, hardly any loss of SO_2 will occur and the pulp will remain in perfect condition for at least a year. This is important as it takes up to three months to deliver the pulp to Bombay; the presence of the gas also serves as a complete deterrent to pilferage in transit, which invariably occurs with consignments of fresh or canned fruits.

The factory is also equipped for the production of apple juice. The apples are sorted and blended, and are



A scene at the fruit-processing factory at Ramgarh

then washed automatically, the juice is extracted in a press, partially clarified in a separator, flash-pasteurised* at 68–72°c and canned. The fruit residue or press-cake is disintegrated and dried, and used as a valuable cattle fodder.

The total productive capacity of the Ramgarh factory per 8-hour day is 3 tons of pulp and 3½ tons of juice. Its establishment in May 1955 was a triumph over difficulties, not least of which was the supply of water which had to be brought up from the valley far below.

Co-operative operations

No small grower or commercial horticulturist could afford to remain independent for long. There was an obvious need for co-operative marketing to supplant the uneconomic and unsatisfactory system of selling the crop on the trees to the highest bidder, whereby unripe fruit was harvested and much damage was done to the trees and inter-planted cash crops.

It was obvious that if the fruit could be harvested correctly and the produce of different orchards could be pooled, mechanically graded and sorted for blemishes, and then packed and transported in standard grades, much benefit would accrue to the growers. Furthermore, orchards could be better maintained if protective measures could be applied by mobile units having co-operatively-owned equipment, which would be far too costly for the individual small grower. In addition off-sized fruits, which are unsuitable for retail marketing by the small grower, could be bulked and processed in the Government factory at Ramgarh.

The Directorate of Fruit Utilisation has provided for the establishment of growers' co-operative societies and the Fruit Development Board is giving necessary assistance in the co-operative marketing of the fruit.

Mechanisation

Some objection has been raised that the use of automatic machinery in these new fruit-processing plants will displace labour and so unemployment will not be reduced.

The new factories will, however, require vastly increased production of fruit, and many more people will be required for work in the orchards.

The automatic canning and packing of fruit products will reduce the cost of production and will bring these products within reach of the lower income groups, to whom canned fruit is at present a luxury. This will result in an ever-expanding fruit industry and greater employment, which is already happening. The Horticultural Extension Service now employs hundreds of workers in the off-season, when formerly there was much unemployment, and at times now there is an actual shortage of labour. It is reasonable to conclude therefore that, if the present trend continues, there will be a steady improvement in economic conditions of the people of the hill districts of Uttar Pradesh.

* A 'Baumann Glocke' pasteuriser is used.

The Forcing of Chicory

H. KAHN

Forcing beds of chicory
The young roots are brought from the nursery and are arranged over the hot pipes; they are covered with 4 in. of soil, insulated by a layer of straw and protected by curved G.I. sheeting. Completed clamps and the power line can be seen in the background

THE cultivation of what the British call chicory started only as recently as 1890. The ordinary cultivation of the crop requires no special knowledge, but during the past few years attention has been directed to forcing this vegetable, which operation can only be done properly by specialists.

Forcing by heat

The seeds are planted in April or May and are dug up in September, when the forcing begins. This process consists of warming the roots of the vegetable in order to produce a second growth – an operation which can have disastrous results if not properly carried out. Success is obtained only when the base or root of the plant is heated and at the same time the top remains unheated. The roots are planted and covered with some four inches of soil, and they are kept well watered.

Originally the necessary heat was obtained by means of farmyard manure but this produced no more than from a 10% to 15% increase in yield, whereas an increase of at least 50% should be obtained. This old method is in fact still followed by small cultivators. Another method, used formerly, was to obtain heat from a hot water system, the roots being planted between the pipes. Electricity, however, gives better control and is now used by most large-scale producers.

Heating by electricity

At first a complicated system was employed which involved the use of heavy equipment which was difficult to handle. This has now been replaced by two alternative methods. The first consists in burying copper tubes at the roots, the power to be used depending on the soil. A light garden soil will produce excellent results when heated by 180w, but in the fields, where the soil is far heavier, at least 200w is required. The tubes carrying the heating elements must be buried an inch or more below the roots and they must be removed and replaced each season. This involves a great deal of work.

The second system has overcome this difficulty. Metal tubes are buried permanently in the soil and the heating elements are then threaded through them. The latter can be removed when the forcing is finished, while the tubes are left in the soil. Thus the element cannot deteriorate during the ' close ' season. Roots can be planted over the same tubes year fter year with excellent results.

There are seven such installations in France, with a total power of 65 kva.

Cost

Normally the soil needs to be heated and kept at about 18°c for about three weeks. The cost for electricity works out at no more than a $\frac{1}{4}d.$ per lb. Low tension current however is more costly and works out at about 2*d.* per lb. With the hot water system, not only are the results not nearly so good, but frequent repairs to the furnaces are necessary in addition to the cost of fuel.

The future, therefore, seems to depend on electricity.

Tomato Yields

Increases averaging more than 50% in their yields were achieved in the 1957 season by tomato growers in Donegal, Eire, who have had heating apparatus installed in their glasshouses under the Department of Agriculture Scheme. The heating equipment was installed in 34 of the houses operating in the country under the Gaeltacht Glasshouse Scheme, and the returns show that these produced an average of 29 cwt. of tomatoes in 1957, compared with 19 cwt. in 1956, before the heating equipment was installed. One grower harvested over 2 tons from a heated house, which represents a yield of 80 tons to the acre.

Tomatoes from the heated houses were ready for marketing towards the end of May last season and the bulk of the crop had been marketed before the normal seasonal glut in August.

The operation of the heated glasshouses did not present any difficulty to the growers, though more constant attention to the houses was necessary and the plants required about twice as much water as those grown in cold houses. The tomatoes were generally healthier and of better grade than those grown without artificial heating. The heated houses remained free from attacks of Botrytis, which has hitherto caused severe losses in the Co. Donegal glasshouse crops.

The heating equipment installed can be fired with turf, and most of the operators were able to supply fuel from their own turf banks.

Seed Dressings

Treatments for Cereals and Certain Other Crops

C. P. HAMPSON, B.SC., M.I.BIOL
(*British Schering Ltd.*)

A major opportunity for bringing food into better balance with population is the elimination of preventable losses in crop yields. Every year a large part of the world's potential harvest is destroyed by diseases and pests which attack the growing crops. Seed dressings represent one of the most effective and efficient methods of preventing these losses, and research is constantly being conducted to produce new treatments that are more efficient, safe and economical to use.

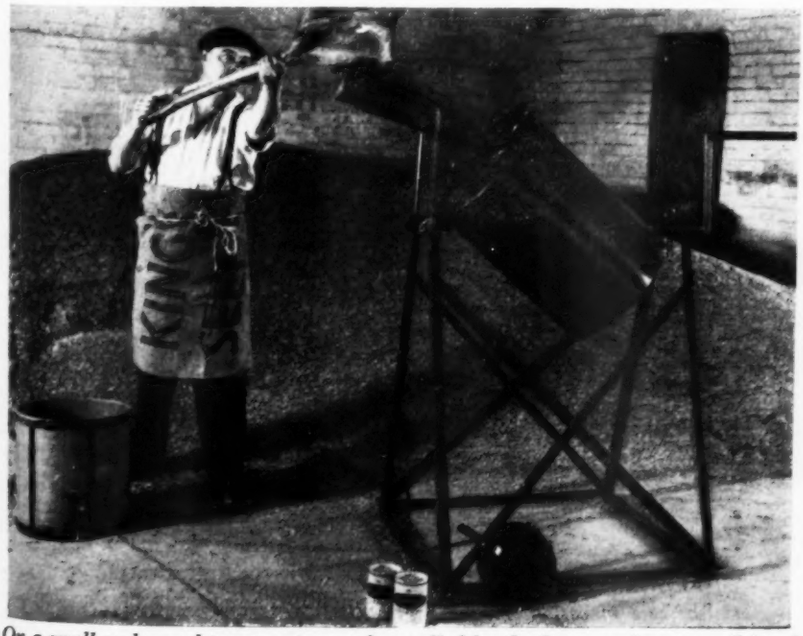
THE importance of good quality seed, of a variety suited to the conditions of the particular district, cannot be over-stressed. Good quality seed should be pure as to type, free from injury and disease and of good germinability. In addition, it should be properly cleaned and treated with a seed dressing to prevent infection of the grain by seed-borne disease organisms. The disinfection of seeds for the control of certain seed-borne disease organisms is one of the most successful and economic applications of chemical crop protection techniques in use today.

Early seed treatments

Although most of the considerable developments in this field have been made in comparatively recent times, the technique of seed treatment is not a new one. The use of chemicals to protect seed against diseases has been practised in one form or another for centuries and it was probably the first attempt at phytochemotherapeutical control.

The Romans used to dress seed with ashes and other concoctions to preserve the crop from disease and since that time varying methods, involving the use of everything from brandy downwards, have been tried. In England, as early as the 17th century, seed grain was sprinkled with sea water and dusted with lime, for it was found that grain salvaged from a shipwreck produced an amazingly healthy crop. The first scientific method, however, was evolved by a Frenchman, Benedict Prévost, in 1807, who found that Bunt of wheat could be controlled by treating the infected grain with minute traces of copper. Using copper sulphate or 'bluestone,' he developed a method of seed treatment which survives to this day.

Nowadays, however, largely as the result of research conducted by interested commercial firms, there is a wide range of chemicals for use as seed treatments and frequent additions to this range are continually being made. Although many different crop seeds are treated with chemicals, cereals are the chief subject for seed disinfection. Recommendations for seed treatments continue to change as newly developed chemicals or methods of application prove to be more effective, more economical, less toxic to the plant and less hazardous to health than the treatments in current use.



On a small scale, seed treatments may be applied by the farmer using a small hand-operated machine

Copper sulphate remained for many years the standard method of 'pickling' cereal seed grain against smuts and other diseases. Later, formalin came into general use because it was equally effective and much less liable to depress the germination of the seed. Copper carbonate dust was widely used in Australia and the west of the U.S.A., but it was never popular in Great Britain as it appears to do best in drier seed beds than are commonly found in the U.K. Cuprous oxide has been recommended especially for dressing vegetable seeds for the control of 'damping-off' diseases, but nowadays thiram seed dressings are more often used for this purpose.

Modern cereal seed dressings

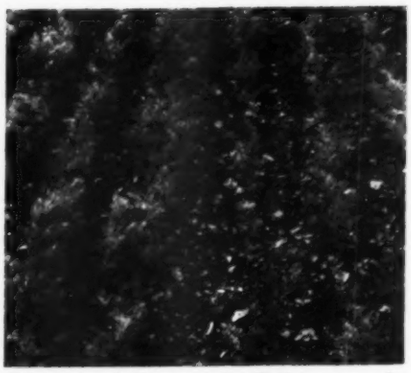
On cereals, the old methods of seed treatment of dipping the seed in solutions of copper salts or formalde-

hyde, or of dusting the seed with copper carbonate, have been replaced by less corrosive and less phytotoxic organic mercurial compounds which are applied in the form of dusts, slurries or liquids. Organo-mercurials are regarded as the most effective compounds yet discovered for use as cereal seed treatments. They control many seed-borne pathogens, such as the Covered Smut fungi, and many soil-borne disease organisms which attack the seed after it is sown. With very few exceptions they have accomplished these ends without injury to the seeds treated. Indeed, very often they have a beneficial effect on seed germination and early seedling growth over and above that due to disease control alone.

Chemicals containing mercury are, however, among the most poisonous ones used in seed treatment and for this reason certain precautions must be observed when handling them. Breathing the dust or vapour from these seed treatments should be avoided by wearing a suitable mask over the nose and mouth, and waterproof gloves should be worn by operatives handling the compounds and treated grain. Because of the poisonous nature of organo-mercurial compounds, a search is being made for less poisonous substitutes.

Among the non-mercurials which have been tested on cereals as possible substitutes for the mercurials, pentachloronitrobenzene, hexachlorobenzene, chloranil, captan and cyclohexamide have shown promise, but in general they do not suppress all the diseases controlled by mercurial seed treatments. For this reason, attention has been directed towards the use of the less poisonous mercurial compounds and to formulations which reduce the hazards involved. Provided, therefore, that mercurial seed treatments are used carefully and reasonable precautions are observed, they may be regarded as the most effective and most suitable preparations for the seed treatment of cereal grain.

Although slurry and liquid seed treatments are extensively used in the U.S.A., by far the most important treatments used in Great Britain are organo-mercurial dusts. These treatments are usually applied by the merchant who supplies the seed and it is done very efficiently in automatic seed-



The control of carrot fly, Psila rosea, *obtained with the use of thiram aldrin seed dressing. On the left treated seed, on the right untreated seed*

dressing machines which are able to dust many hundreds of bushels of grain per hour. On a small scale, seed treatments may be applied by the farmer using a small hand-operated machine or even a clean, closed barrel in which the seed and the powder are rolled and rotated for a few minutes.

So effective are these organo-mercurial seed treatments that nearly all the cereal seed sown in the U.K. today is treated with one of a number of different proprietary products. The manufacturers of these seed dressings claim various advantages for their particular product, but the differences between 'approved' products are slight and they all provide effective and economic protection against seed-borne disease.

Dual-action dressings

In addition to these 'straight' organo-mercurial seed treatments, seed dressings are now available which incorporate an insecticide as well as an organo-mercurial compound. These 'dual-action' seed dressings are used

Photo: East Malling Research Station

Angular leaf spot of cotton, X. malvacearum. This is controlled in the Sudan by seed treatment, using 'Abavit B'

on cereals for the protection of the crop against seed-borne diseases and also for protection against wireworm and other soil insect pests which attack the young seedling.

Gamma BHC was the first insecticide to be used in these seed treatments, but since the discovery of the insecticidal properties of BHC in 1942, other potent insecticides for the control of wireworm have been discovered. Amongst these must be mentioned the chlorinated hydrocarbon insecticides, aldrin and dieldrin; dual-action seed treatments, containing one or other of these insecticides, are now listed among the approved crop protection products of the Ministry of Agriculture, Fisheries and Food.

So far as wireworm control is concerned, the differences between aldrin, dieldrin and gamma BHC are not great. Gamma BHC seed dressings have been used on a large scale for many years now and successful protection against wireworm attack has been obtained with their use. Similar results of highly satisfactory wireworm control have also been obtained with aldrin organo-mercurial seed dressings and dieldrin organo-mercurial seed dressings. An important difference between these three insecticides, however, is in their relative phytotoxicities.

This aspect of seed treatment – the toxic effects that certain insecticides may have on seed germination and plant growth – has attracted much attention in recent years. Extensive investigations on this point were carried out by Franklin[1] at the Kansas State College, using wheat on land where the wireworm infestations were very low, so as to allow the effects of seed treatment with aldrin, dieldrin and gamma BHC, to be accurately assessed. Franklin's results revealed that gamma BHC, as a seed treatment, was considerably more phytotoxic than aldrin or dieldrin.

Similar results were obtained from a series of trials conducted in the U.K., using aldrin/mercury, gamma BHC/mercury and straight mercurial seed treatments on wheat, barley and oats. In these trials aldrin/mercury seed treatments were shown to be considerably safer than gamma BHC/mercury seed treatments on seed which had a high moisture content, or which had been slightly damaged or bruised.

Filling the powder hopper of a seed-dressing machine. To avoid inhaling the dust, a mask or filter should be worn over the mouth and nose

If it is known that the seed to be treated with a dual-action seed dressing has a high moisture content, or if the treated seed is to be stored for some months before sowing, then it is advisable to use a dual-action seed dressing containing aldrin or dieldrin, rather than one containing gamma BHC[2].

Varying degrees of damage can result from wireworm infestation, ranging from reduced yields to the loss of an entire crop. Treating the seed with a ' dual-action ' seed dressing is probably the most economical method of controlling wireworm and other soil insect pests.[3] Ploughing and re-seeding is not always a satisfactory answer, for the wireworms will remain in the soil and cause further losses at a later date if the seed remains unprotected, but where infestation is high, even chemical control cannot be expected to give complete protection. Seed dressings can, however, provide an economic assurance against heavy losses caused by wireworm, as is shown in Table 1.

These trials were conducted to show the effects of adding an insecticide to the usual organo-mercury seed treatments. Had the ' control ' not been treated at all, the differences would, of course, have been greater, due to losses caused by seed-borne disease as well as wireworm attack. Seed treatment, with the combined aldrin organo-mercury seed dressing ' Granadin,' costs not more than 4*s.* 0*d.* per acre (considerably less when large quantities are used). From the results obtained at Trial Site 4, as shown in the table, seed treatment with ' Granadin ' prevented the loss of 7.6 cwt. of grain per acre, representing a gross saving of £10 17*s.* 3*d.* when assessed at the 1957 standard average price for wheat of 28*s.* 7*d.* per cwt.

Cotton seed

Although cereal seed grain is the chief subject for seed treatment, large-scale applications of the process is made to many other crops. Thus, it is customary to treat large quantities of the commercial cotton seed, sown in the Sudan, with 'Abavit B,' a proprietary mercurial seed dressing used to control Blackarm Disease, *Xantho-*

Table 1

Control of wireworm by seed treatment using a combined aldrin organo-mercury seed dressing

	Trial Sites											
	1		2		3		4		5		6	
Wireworm population per acre	750,000		725,000		875,000		780,000		750,000		620,000	
Cereal	Capelle wheat		Sun II Oats		Koga II Wheat		Capelle Wheat		S.225 Oats		Heine 7 Wheat	
	Plant count	*Grain yield*	*Plant count*	*Grain yield*	*Plant count*	*Grain yield*	*Plant count*	*Grain yield*	*Plant count*	*Grain yield*	*Plant count*	*Grain yield*
Seed Treatment – 2 oz./BU.:												
Control ..	67.6	21.6	80.0	17.4	67.0	18.0	55.7	22.5	51.0	18.1	82.0	27.2
Granadin ..	93.2	26.5	102.0	21.2	104.5	23.8	86.2	30.1	124.7	25.1	114.2	33.4
Sig. Diff. at 5%	12.7	2.0	8.8	1.6	29.8	5.7	26.3	5.0	18.9	6.6	31.9	2.1

Plant counts expressed as means of 6-ft. length of row.
Grain yield expressed in cwts. of grain per acre.
Control treated with a 1% organo-mercurial seed dressing.
Granadin is a combined ' dual-action ' seed dressing containing 20% aldrin and 1% Hg.

The oats on the right were treated with Granadin. The left half of the field was sown with untreated seed and suffered heavy losses, due to wireworm attack

monas malvacearum. In other countries in Africa, where cotton seed is treated against Bacterial Blight, another name for this disease, cuprous oxide dusts are used because of their less poisonous nature. Mercurial seed dressings, however, have been shown to be more effective for this purpose and experience in the Sudan, where mercury treatment of cotton seed with 'Abavit B' has been practised for more than 20 years, has shown that, with adequate control and supervision, the hazards involved in the use of these compounds can be reduced to a negligible level.[4]

In the U.S.A., where it is officially recommended that all seed should be treated to control pre-emergence and post-emergence blight, anthracnose and bacterial blight diseases, organo-mercurial treatments are used on an extremely extensive scale. Bacterial blight of cotton may be controlled for a time by breeding highly-resistant varieties, but, as the disease organism is variable, resistance of a new variety to this disease may quickly be broken down. The likelihood of this will be greatly reduced by other additional methods of attack on the disease organism and for this reason seed treatment of cotton is advocated.[4]

Combined fungicidal/insecticidal treatments for use on cotton seed are being investigated at the present time in Africa with a view to controlling flea beetles, termites and other soil pests, as well as seed-borne diseases. Similar developmental trials are being conducted on the use of these combined seed dressings on such crops as maize, sorghum and groundnuts.

Sugar-beet seed

It is a routine practice in Great Britain to disinfect all sugar-beet seed with organo-mercury dusts and investigations are being conducted on the use of combined fungicidal/insecticidal treatments containing aldrin and mercury, BHC and mercury, and dieldrin and mercury, for protection against seed-borne diseases and wireworm. Thiram seed dressings are used on flax and it has been reliably estimated that, as a result of seed treatment, the value of the U.K. flax crop was increased by some £2,000,000 during the war years.

Vegetable seeds

The seeds of many vegetable crops, including beans, beet, carrots, brassicas, peas, pepper and tomatoes, are treated with preparations containing such chemicals as mercury, thiram, captan, dichlore and chloranil, to control certain seed-borne diseases and to prevent 'damping-off' caused by soil-borne disease organisms. Thiram seed dressings, combined with such insecticides as aldrin, BHC or dieldrin, are widely used on brassica crops to prevent flea beetle attack, to prevent carrot fly, *Psila rosae*, on carrots, and for the control of seed-borne diseases, 'damping-off' and insect attack on many other vegetable seeds.

Internally-borne diseases

Certain seed-borne diseases cannot be effectively controlled by surface treatment with fungicides because the pathogen is within the tissues of the seed. Examples of these diseases are the Loose Smuts of wheat and barley which cannot be controlled by organo-mercurial seed treatments. For the control of these diseases and certain internally-borne diseases of plants propagated from setts, tubers, bulbs and pieces of the plant stem or root, etc., the only satisfactory method of sterilisation is by heat. Thus, hot water treatments are used to control Loose Smut diseases of wheat and barley and to disinfect sugar-cane and pineapple cuttings, to control chlorotic streak and ratoon stunting diseases, etc. Accurate regulation of the temperatures employed and exact timing of the treatment is required, as the margin of safety between efficient sterilisation and injury is small. Short-wave diathermy has also been tried to control Loose Smut of barley, but so far with little promise of practical application.

The term 'seed' has been extended here to include not only the true seed but also plant parts used for vegetative propagation. For example, potato tubers may be steeped in formalin or mercuric chloride solutions to control common and powdery scabs and skin spot diseases. Similarly, sugar-cane cuttings are dipped in organo-mercurial fungicides such as 'Abavit S', to control Pineapple Disease, *Ceratocystis paradoxa*.

REFERENCES

1. Franklin, W. W.: Fort Hays Branch Station, Kansas State College, Semi Ann. Rep., Sept., 1951.
2. Gough, H. C.: *Farmer and Stockbreeder*, 18 September, 1956.
3. Hampson, C. P.: Marshall, A., Norris, W. L.: *Chem. Products*, June 1957.
4. Wickens, G. M. : 1957, *Emp. Cott. Gr. Rev.*, Vol. xxxiv, No. 3.

Olives in Spain

M. R. BULL

Next to the orange the olive is Spain's greatest asset. The olive was first introduced about the 9th century B.C. from the Middle East and the earliest plantations were established along the Costa Brava coast in Catalonia and in Tarragona. During the eight centuries of their occupation of the Iberian Peninsula, the Moors extended its cultivation throughout the south and organised the production of olive oil.

Olives are sold plain, stoned or stuffed with tomato or anchovies. The extracted oil is used for preserving fish, as a salad dressing and as a cooking oil

THE cultivation of the olive in Spain continues to spread; the area under this crop has risen from 850,000 ha.* in the middle of the last century to some 2.2 million ha. in 1953, a growth of some 70% over a period of 35 years. Today the crop is cultivated in 37 of the 50 Spanish provinces.

The most important producing regions are Andalucia, Catalonia, La Mancha, Extremadura and Levante. The province of Jaen, in the south, produces the most – 28% of the total; next comes Cordova and then Seville.

Climate

The olive is very hardy, liking the barren hills and dry soil of Spain, and withstanding the high summer temperatures, which may exceed 100°F or fall below freezing in winter. It can even stand a temperature of 18°F, provided the thaw comes slowly. However, during the exceptionally cold conditions of the early months of 1956, when temperatures descended to 14°F and biting winds blew from the north, great damage was done to that year's crop and many trees died. Some years are exceptionally dry and irrigation, even if it were feasible and economic over the wide waterless expanses, would not compensate. Rain must come at the right season, if the fruit is not to suffer.

Planting practice

There are two ways of planting olive trees. To obtain fruit as quickly as possible, cuttings consisting of one slim piece of branch are planted, often in nursery gardens, and are transplanted in the plantation after they have become established. These trees will begin bearing after some six years, but on the other hand they will age quicker than those obtained by the alternative method.

This consists in planting directly in the ground cuttings with three 'prongs.' These will not bear for some 12 to 15 years but will thereafter continue to give satisfactory yields for a long time. The best yields are obtained when the trees are from 40 to 100 years old, though they will go on bearing fruit for many more years.

The trees are planted some six yards apart in parallel lines which extend away, over hill and dale, to the far horizon.

Pruning

In the early months of the year, the trees are pruned of all dead and weak branches. Big branches are generally cut back to encourage the tree to spread outwards, rather than grow upwards. Most trees are fairly low and are pruned to a round shape, generally springing from two or three trunks, or large branches. Sometimes the foliage is thick, sometimes thin, depending on soil conditions. The pruned wood and tops are either burnt on the spot or taken by wagon to the farm for fodder for the horses, mules and goats, or for firewood.

Cultivation

The ground beneath the trees is ploughed after the pruning. Tractors are only rarely used but teams of four or five mules will plough abreast so that four rows are made simultaneously. As the ground is generally poor, catch crops are seldom planted under the trees for fear of affecting the size and quality of the olive crop, though occasionally beans or wheat may be planted. In Spain, one of the best soils is the terracotta red clay of the south, which makes such a colourful contrast to the silvery green of the leaves.

Grafting

Olive trees are frequently grafted; sometimes the whole tree, if weak, is cut back, leaving sometimes only a single branch. The graft, from the same strain or some other, consists of two or more small pieces, about four inches long, of new wood placed in notches round the cut-off branch. They are then wrapped in paper or

*Ha.=2·471 acres.

sacking and secured tightly with fibre or string.

Harvesting

Two or three months before the harvest, towards the end of the summer, the ground is fertilised with nitrate of ammonia, organic fertiliser or ' orujo ' (press cake). The fruit is collected from the middle of November till the middle of January, according to the region. Men and women go through the plantation in groups beating the trees with long poles and picking up the fruit from the previously-cleared ground. It is then transported by wagon to the ' almazaras ' or mills.

The fruit

There are two colours of olives, black and green. All olives, of course, begin by being green. Those for eating are picked before they turn black – about a month beforehand. Although the black ones are nearly all used for crushing, some are kept for the table. They do not have such ' bite ' but they contain more oil. Another variety remains green and does not turn black. The olives of Seville are mostly of this variety and they are kept for the table. This province produces 64% of the table olives produced in Spain.

In size, olives vary from about half an inch to about an inch in length. The largest are the most expensive and are ideal for stoning and stuffing. The province of Jaen is noted for its large, black olives, which give a high yield of oil. The whole of the crop produced here is crushed and the oil is exported.

At the present time over 4,850,000 trees in this province are affected by ' aranuela,' a small spider, which attacks the buds and young shoots. As soon as this season's crop has been harvested, the trees will be sprayed with insecticides, both from the air and from the ground; for this purpose 26 small aircraft and 120 ground sprayers, many mounted on tractors, will be used.

The fruit is crushed several times. The first pressing producing the best oil for odour, flavour, colour, density and acidity. The residue of crushed pulp and stone is called ' orujo ' and from this, second-grade oil is obtained and such by-products as soap and glycerine. The final residue is used for fertiliser and pig fodder and sun-dried for use as fuel.

A plough drawn by four mules being used for the cultivation of an olive plantation

Yields

The crop is very erratic and uncertain. Not only does it depend on climatic conditions but also on the ' veceria,' the name given to the alternating fluctuations in crop, a good crop being usually followed by a bad one. The crops also reach a climax every few years; 1930, 1945 and 1949 being very poor, while the 1951–52 crop was the best of the century, yielding over 650,000 tons of first-grade oil and over 50,000 tons of refinable ' orujo ' oil.

Although Spain's olive crop is increasing every year, demand still exceeds supply, despite the set-back in trade due to the Spanish civil war and the second world war. The civil war did not cause much damage to the trees but during the second world war many foreign markets were lost. Partly owing to the difficulty of importing olive oil, many countries have found substitutes. It is the aim of the ' Sindicato Nacional del Olivo ' and of the ' Federacion Internacional Oleicola ' to try to regain these markets.

They are also encouraging the adoption of more modern machinery, as many of the fourteen thousand oil mills still use old-fashioned methods of handling, crushing and refining. Although Spain is ahead of other olive-producing countries, there is always the risk that they will catch up by using more efficient methods and so produce oil at lower cost.

Consumption

Olive production in Spain represents 44% of total world production but although crops are becoming larger, the total exported today is less than it was 20 years ago. Prior to 1935, 60 million kg. of oil were exported. Now the amount is only some 18 to 20 million kg.

This is due partly to the loss of foreign markets as previously mentioned and partly to the increasing home consumption. Spain's population has considerably increased since 1935 and each person consumes an average of 12 kg. of olive oil per year, together with seven kg. of other fats, mostly of animal origin.

Need for modernisation

The olive industry in Spain, like many other of her crops, such as oranges and sugar-cane, is seasonal. During the harvest, which lasts some three months, and the subsequent processing of the oil, about a million people are employed. After that the people so employed are idle until the next crop.

Many of these oil mills are owned privately or by small companies who are reluctant or unable to find the capital for the modernisation of their equipment. However, both the Sindicato Nacional del Olivo and the Federácion Internacional Oleicola are encouraging both the modernisation and the expansion of the industry.

(Right) *The system of replanting an old plantation. The stumps of the old trees are covered by a pyramid of beaten earth*

(Below) *The system of grafting. This tree has been cut right back, leaving two stumps and on this root stock, four new branches have been grafted*

Maintaining exports

The possibility of growing other oil-bearing crops, such as groundnuts and cotton seed, is also being studied. The purpose is to supplement home olive oil consumption, so that exports can be kept at the same level, especially in bad seasons. At present some soya-bean oil is being imported and mixed half and half with olive oil for domestic consumption. The mixed oil is sold at 13 pesetas per litre as against 22 pesetas (about 3*s*.) for the pure olive oil, which is much preferred by most Spaniards.

So far these plans are only in the initial stage. Both cotton and groundnuts are grown in Spain; the former crop, now yielding some 8,000 tons, is found in the provinces of Estremadura, Seville and Alicante, and the latter in Valencia.

If the production of both these crops could be expanded, the oil so obtained could take the place of the imported soya-bean oil. This would save the expense of this import and at the same time would allow exports of olive oil to be maintained, or even to be increased.

Boron for Fruit

It is reported that several instances of suspected boron deficiency have been observed on peach trees in the Sandhills area of N. Carolina. The disorder is characterised by reduced leaf size, greatly shortened internodes, excessive branching, reduced fruit set and yield, and internal necrosis in the fruit. This disease is said to be associated with low levels of boron, as indicated by leaf and twig analysis. Unfortunately it is not stated whether this condition was corrected by the application of boron to the trees in the affected orchards.

From Italy, however, there is news that the fruit set and yield of olive trees can be improved by applications of boron, the improvement being most marked in the year following the applications. It is claimed that the beneficial effects of adding 17.5 g. of boric acid per tree to the NPK fertiliser lasted for three years in the case of young trees; while trees, aged 40 years or more, were cured by the addition of 190 g. with the fertiliser applications to each tree, but the symptoms reappeared again after two years.

It is well to warn those who may be considering trial applicationss that excessive amounts of boron can be toxic and that it is best to make the applications in very dilute solution.

Technical News

Articles in the May issue of other journals of the Leonard Hill Technical Group include the following:

Dairy Engineering, which is a special issue on Electricity in the Dairy – 'Electrical Equipment for Dairies', 'Power Requirements in German Dairies' by F. Lang, 'Production and Performance of Paraflow Pasteurising Plants', 'Cheesemaking in Czechoslovakia' by Ing. Jiri Zapotocky, 'Current Progress in Cartoned Milk'.

Public Works and Muck Shifter. 'Power and Irrigation Works in Ceylon' by Richard J. Salter, 'Glen Canyon Dam Under Construction' by Richard J. Salter, 'Engines for Civil Engineering Plant and Equipment.'

Chemical & Process Engineering. 'Oils and Fats' by M. K. Schwitzer, 'Estimation of Gaseous Densities' by M. V. Künte and L. K. Doraiswamy, 'Costs of Mild-steel Drums', 'How Granules are Formed', 'Preview of XIIth ACHEMA Exhibition and Congress.'

The Citrus Industry in Cyprus

H. HIRST AND A. PANARETOS
(*Department of Agriculture, Cyprus*)

Citrus, now widely grown in many sub-tropical regions, was originally a native of the East. It appears to have found its way to the Mediterranean countries many centuries ago but was not grown on a commercial scale until comparatively recently.

ALTHOUGH the cultivation of citrus in Cyprus has been going on for many centuries, it is only since the British occupation that its culture has assumed commercial importance. At the turn of the century the total production of citrus in Famagusta was only about a million fruit. Today the production of citrus in that area alone is at least 60 millions, while for the whole island it is now around 235 millions.

Development

During the last 25 years a great increase in the production of citrus fruit has taken place in the Limassol and Morphou Bay areas, where an excellent late crop is obtained. Much of the post-war planting has been made in the latter area and its effect is just beginning to be felt in the export market.

At the end of 1955 it was estimated there were some 1,828,000 citrus trees in Cyprus, of which some 85% are to be found in Famagusta, Nicosia and Limassol districts – in that order of importance.

Requirements

Unfortunately there are several limitations to an expansion of citrus growing on the island – more especially climate, soil and water – but there are still a number of areas where further planting is possible. These are the Morphou Bay area, the area known as Zakaki, south of Limassol town, the Paphos Chiftliks (estates) in the south-west of the island and another area in the north-west around the town of Polis.

Citrus likes a deep, well-drained soil and an adequate supply of irrigation water, containing not more than 500 parts per million of chlorine and preferably much less. The need for a mild climate means that, by and large, the commercial groves must be established in coastal areas. These areas are, however, often subject to strong winds and the groves must therefore be protected by windbreaks of quick-growing trees such as cypress. Near the coast canes, *Arundo donax*, are often used for this purpose. Citrus may suffer severely from salt-laden sea breezes, from strong winds, but more especially from the frosts which are experienced from time to time, even in the mildest areas. Near the sea, care must be taken not to use brackish water for irrigation, owing to its chlorine content. Over-pumping of the Famagusta area resulted in many wells and boreholes yielding brackish water, with disastrous results to the trees.

Various areas of Cyprus have gained a reputation for different types of citrus fruit. For example Famagusta is noted for its early ovals (Jaffa type oranges); Lapithos (Kyrenia district) for its sour lemons; the Limassol

Table 1
Citrus: Production and Exports

	Production		
	Oranges (cases)	*Lemons (cases)*	*Grapefruit (cases)*
Average 1935–39	461,240	65,585	44,444
,, 1945–49	534,008	136,169	123,154
1953	985,962	167,163	203,592
1954	807,145	152,741	228,952
1955	844,123	172,641	251,800
1956	835,730	213,610	182,483

	Exports					
	Oranges		*Lemons*		*Grapefruit*	
	Cases	*Value £*	*Cases*	*Value £*	*Cases*	*Value £*
Aver. 1935–39	289,733	66,388	53,612	12,773	9,918	2,638
,, 1945–49	319,874	271,589	28,853	21,782	102,942	83,650
1953	622,581	643,123	98,529	145,773	151,949	183,509
1954	699,412	877,714	108,929	153,424	175,127	246,569
1955	571,306	722,488	128,038	192,949	173,677	202,080
1956	819,661	1,246,993	167,834	230,677	141,951	171,426

area, especially the large and well-organised Cyprus Palestine Plantations, for its grapefruit, and Valencia and the Morphou Bay area for its late ovals, and more recently for its Valencias, a variety which has been increasingly planted in post-war years. The quality of Cyprus citrus fruit has been improved enormously during recent years. Credit for this must be given to the Produce Inspection Service which, backed by suitable legislation, has been able to ensure that only well-ripened fruit, uniformly packed and free from insect pests and blemishes, is exported.

Cypriot women cut the fruits individually and place them in their cloth shoulder bags. Careful handling and picking at the right degree of maturity are essential

Pests

Over many years the Mediterranean fruit fly has been a serious source of loss to citrus growers. During the last few years, the activities of the Plant Protection Service of the Department of Agriculture has ensured that the ravages of this pest are no longer of serious economic importance. By using modern insecticides and developing application techniques suited to local conditions, it has been shown that this pest can be effectively controlled at a relatively small cost.

There are other pests and diseases of citrus in Cyprus, some of which were unfortunately introduced from the mainland before the Plant Protection Service came into being. Some of these, such as rust mite and red scale, can be controlled fairly effectively but they do involve growers in considerable expense and trouble. In a few areas of the island, mussel scale has made its appearance. Efforts are being made to restrict its spread, especially by seeing that fruit and root stocks grown in infested areas are not distributed in those which are clean.

Production

Table 1 shows the production and exports of citrus fruit in 1956 compared with recent years and pre-war and post-war averages.

During war years, some difficulty was experienced in exporting citrus and many growers had to be helped by loans made under the Citrus Industry Aid Law of 1941. This Law provided for interest-free loans to growers to allow them to maintain their groves, including the adoption of pest and disease control measures, and also for the growing of associated and alternative crops as well as the keeping of livestock.

Towards the end of the war and in early post-war years a large proportion of the citrus crop was sold through a Government Marketing Organisation to the U.K. Ministry of Food.

After the war many groves inevitably showed the result of the wartime scarcity of fertilisers and of neglect, but remunerative prices for fruit encouraged good treatment and soon post-war production, helped by fruit from many young groves, just coming into production, quickly surpassed the pre-war figure. Grapefruit exports in particular soared as a result of the greatly increased production in the Limassol area, especially by the Cyprus Palestine Plantations.

A factory started initially for canning grapefruit is now extending its operations to other citrus fruits, as well as to the production of fruit juices obtained from unexportable fruits. It is reported that in the 1955–56 season over 7,000 tons of citrus fruits were utilised for canning and for juice extraction.

Picked fruit being loaded in the field into a lorry for conveyance to the packing shed

The future

It is somewhat difficult to forecast what the future is likely to be for Cyprus citrus fruit. A good deal of new planting has taken place in other countries which compete in marketing their fruit at the same season. Some of these are more favourably located

climatically and from the point of view of water supply. They have also been able to plant trees in such a manner as to facilitate mechanical cultivation and plant protection measures, thus cheapening production costs, whereas many of the older groves in Cyprus are too thickly planted to permit mechanical cultivation. With more recently planted groves, growers have gone to a great deal of trouble to level the land, so as to facilitate irrigation, as well as mechanised operations. Much of this new planting has consisted of Valencia oranges, for which there seems to be a good market, both in Europe and the Far East. If, as seems likely, the long-term future for the marketing of Cyprus citrus fruit lies in the production of frozen juices for the European market, then Valencia oranges should prove to have been a sound choice.

Research

The Department of Agriculture is helping the citrus industry to produce better quality fruit by improved production techniques and the more balanced use of fertilisers and has established an experimental citrus station in the Morphou area.

One of the main experiments will be to demonstrate the interaction of nitrogen and phosphorous and its effect on the growth and yield of Valencia oranges grown on bitter orange stocks.

An experimental citrus grove, established in the Famagusta area many years ago, has already supplied a great deal of useful information, especially on the spacing of trees and on the affinity of various scions and stocks under local conditions. A root stock/scion trial is now being established, in which 12 different root stocks will be tried out with commercial orange varieties. Seed of ten root stock varieties has been obtained from the University of California, Riverside Station, while budwood of several varieties of citrus has also been introduced from the same source.

'Cleaner Fields and Heavier Yields'

A film produced by May & Baker Ltd., and available from them. Running time: 24 min.; 16 mm. Kodachrome.

The film is suitable for showing to young farmers' clubs, farm institutes and agricultural colleges. It will also have some interest for agricultural merchants and distributors.

The first part of the film shows, by means of animated diagrams and skilfully contrived time-lapse photographic studies, the historical development of weedkillers and how, in current farming practice, corrosive, defoliant weedkillers and those that are dangerous to animal life have largely given place to more specific, selective weedkillers that are safe to handle. In the second part, visits to two farms show the correct choice and application of selective weedkillers in practice. The importance of the correct use of spraying machinery is emphasised and we see the spraying of different crops and also of hedges for the control of bramble and brush. Using animated charts and live-action photography, the final section summarises the techniques of weed control and the variety of selective weedkillers now available.

Coming Events

Silage. A unique opportunity to see the latest developments in silage machinery and in the methods used for its production will be provided by the National Silage Demonstration to be held at Hatch Warren Farm, Basingstoke, Hampshire, England, on 21 and 22 May. The Minister of Agriculture, the Rt. Hon. J. H. Hare, M.P., O.B.E., will open the demonstration and this will be followed by short talks by Prof. S. Watson of Edinburgh University and by Mr. E. M. Owens of the National Farmers Union. No less than 22 manufacturers will be taking part in the practical demonstrations and in the exhibition of agricultural machinery.

Convention and Festival. A World Farmers' Convention and Festival is to be held in Israel from 26 July–8 August. Arrangements are being made by the Ministry of Agriculture, Jerusalem, Israel.

Seaweed. The 3rd International Seaweed Symposium will take place from 13–19 August in Galway, Ireland. Particulars may be obtained from University College, Galway.

Water Resources. A four-day conference on hydrology and water resources in East and Central Africa is to be held in Kampala from 18–22 August. Among matters to be discussed will be absorbitive losses in canals; silt transportation; sedimentation; hydro-geology (ground water); catchment area research; and hydrological instrumentation and measurements. The Secretary of the Conference is Lt.-Col. S. P. Fearon, of the East Africa High Commission, P.O. Box 30005, Nairobi, Kenya.

Botany. The IXth International Botanical Congress is to be held in Montreal, Canada, from 19–29 August and some 4,000 participants are expected from all parts of the world. Dr. W. P. Thompson, President of the University of Saskatchewan and international authority on genetics of cereals will preside, and the programme will contain papers and symposia related to all branches of pure and applied botany. Enquiries should be addressed to the Secretary-General, Dr. C. Frankton, IXth International Botanical Congress, Science Service Building, Ottawa, Ontario, Canada.

Genetics. The Xth International Congress of Genetics will be held at McGill University in Montreal, Canada, from 20–27 August. The scientific programme will consist of symposia, invited papers, contributed papers and demonstrations, exhibits, panel discussions and special meetings, covering all branches of genetics.

Agricultural Economy. The Xth International Conference of Agricultural Economists will take place at Mysore City, India, from 24 August–4 September.

Land Development. A second International Seminar on Land Development for Agricultural Uses is to be held at Wageningen, the Netherlands, from 25 August-12 September. Subjects to be discussed during the first of the three weeks will include aims and objectives of land development; physical conditions, including soil classification; land classification according to present land use; farming systems; demographic, sociological, and economic factors affecting land development, etc. The second week will be devoted to field trips and discussion of three typical project areas. Enquiries and applications should be sent to The Secretary, International Agricultural Study Centre, 1 Generaal Foulkesweg, Wageningen, the Netherlands.

Rubber seedlings in a nursery before being planted out. Here they are being weeded, cultivated and manured with a 'Gardenmaster'

Cultivating between rows of young tea bushes with a 'Gardenmaster' which simultaneously forks in the manure. The spacing is usually between 3 ft. and 4 ft.

The use of Machinery on Tropical Plantations

RAY WIJEWARDENE

The author of this article is an agricultural engineer and proprietary planter from Ceylon

THE problems faced by European countries during the period of the industrial revolution now confront the plantation manager in tropical countries. Ever-rising costs of production stress the need for mechanisation of many of the tasks performed by manual labour; on the other hand, rising populations, particularly on the plantations themselves, oppose attempts to reduce the number of workers by the introduction of machinery. Gradually, as in the West, the greater need for raising individual productivity is gaining ground as the only avenue through which the general standard of living in these countries can be raised.

It is hard to envisage the mechanising of skilled manual operations such as the tapping of rubber trees, the selective plucking of high-quality teas, and the collection of cocoa pods – all operations which figure largely in the cost of production of these crops.

However, besides such harvesting operations there are others which can and already are being mechanised with advantage both to the operators of the plantations as well as to the workers manipulating the machines. On one hand there are processing operations – the conversion of green leaf into packaged black tea; the coagulation and rolling of latex into sheet rubber; or the expression of edible oil from copra. On the other there are the various tillage and cultural operations necessary for the efficient production of plantation crops.

On the more gently undulating or on flat lands, such as on the rubber and coconut lands of Malaya, the agricultural tractor has found acceptance for the initial preparation of the land from jungle or old plantation, for contour ridging, for seeding the cover crops, for mulching or slashing these covers when they tend to compete with the main crop, and for general haulage on the estates.

On the steep lands, such as on the hillsides where tea is usually grown, in Assam or Ceylon, or whenever crops are planted so closely as to make it impossible for the tractor to operate, the lighter horticultural machines are rapidly proving their utility. Labour-loaded operations such as the weeding of rubber seedlings in nurseries, the manuring and inter-cultivation of contour-planted tea, the weeding and cultivation of multiplication nurseries, are thus being carried out expeditiously and economically by these little cultivating units during the brief periods when the weather conditions are favourable for such operations.

The most satisfying feature of this development from the sociological point of view is the increased earning capacity of the operator who is skilled in the use of these machines, because of the greater productivity, at lower cost, of the plantation.

Wealth from Cocoa

GEORGE FARWELL

Cacao was first introduced into New Guinea from Samoa at the beginning of the century. The last few years have seen a rapid advance in the production of cocoa, which now takes fourth place in the Papua–New Guinea economy and is exceeded only by copra, gold and rubber. With large areas suitable for expansion, and an assured market, the outlook seems very promising.

VARIOUS crops have been introduced and tested in New Guinea from time to time—rice, maize, coffee and groundnuts—but none has shown such promise as a steady money earner as cocoa. In the past, the mainstay has been the coconut, but fluctuations in the world market make copra a doubtful proposition for the more remote regions whence shipment is so costly, because coconut oil can always be replaced by other oils, such as cotton-seed and soya-bean oil, which at any time may be over-produced and lead to low prices.

Cocoa appears to have a more steady and assured future than copra. Chocolate manufacturers throughout the world state they can handle up to a million tons each year. Present supplies—drawn mainly from West Africa, South America and, to a lesser extent, Samoa—amount to less than 750,000 tons.

Production

The first New Guinea cocoa was sold on the European market as far back as 1907, when it gained a premium over the dominant West African product. With the outbreak of war in 1914, planting was abandoned and no further interest was taken in it until the copra market collapsed during the 1930s, when some other crop had to be found. The highest export figure reached before the second war was only 350 tons.

Exports from Papua–New Guinea are still comparatively small. For the financial year ending 30 June, 1955, they reached 1,106 tons, produced by native and also by European growers, the latter contributing 75% of the total. This was an advance of 378 tons over the previous year. The gross return in 1955 amounted to £525,000. Production is expected to rise sharply each year as more and more new trees come into bearing. Normally the cocoa tree takes five years to bear, but plantings in New Britain and elsewhere have produced mature beans in four, sometimes even three years, which shows how suited cocoa is to the climate and soil of this region.

During the past five years more than a million trees have been planted by native growers alone. Large numbers of them have not yet come into bearing. When they do these growers should have a potential crop of 1,000 tons each year. At present market prices this should give them a gross return of nearly £400,000 per annum.

Estate production

The Administration, by opening up land not required by natives to European settlers, aims at an annual production of 12,000 tons within the next few years. That would create a £5 million industry. Eventually it may even be raised to 20,000 tons each year. Already a number of extensive plantations have been started under European management. In acreage and production they exceed native plantings, but this will not always be so, for labour is limited and villagers are constantly being encouraged to plant more cocoa for themselves.

Village production

The growing of cocoa on large plantations in the territory can do much to meet world demand, for plenty of land is available. Labour, on the other hand, cannot be found so easily, owing to the requirements of other industries. It is also the Administration's policy to encourage independent native production, which is being developed, wherever possible, at village level. This will avoid the mistake of creating a mass of landless people.

To assist village growers to gain a market the Administration is loaning money for them to build depots for fermenting cocoa. These are usually located within easy reach of a number of villages. Repayment is made by the levy of one penny on each pound of wet beans sold. Seed is also supplied free of charge to the villagers from the Administration's Keravat Experimental Station near Rabaul. European growers buying seed are charged threepence a pod, which is below the market price.

Perhaps the greatest difficulty in promoting a new industry among people who are, in many cases, only two or three generations removed from a stone age way of life is their primitive outlook. Many tribal groups still cling to an age-old peasant economy with its extremely individualistic outlook. The growing of a crop like cocoa on a commercial scale needs a more communal approach and this means intensive work in the social field to turn the people from a mere subsistence economy based on coconuts, yams and fish to a money economy based on the communally organised production of cocoa for export. Agricultural extension officers move about the country advising on methods of planting and tree care, and help them with marketing.

One of the virtues of the cocoa tree is that it bears all the year round, with two strong flushes at the change of season. This makes it particularly suited to a village economy as it provides the encouragement of regular returns.

A cocoa plantation in New Guinea interplanted with Leucaena glauca *to provide an overhead canopy. The trees are in bearing in about five years and have an economic life of from 40 to 50 years*

Climate

From a climatic viewpoint Papua and New Guinea have proved ideal for cocoa. The best areas for its cultivation have a rainfall ranging between 100 and 120 in. a year. This favours New Britain, which has no sharp distinction between wet and dry seasons. Recently, however, the Gazelle Peninsula had its longest known dry spell, lasting five months. Although growth ceased during this period, the trees suffered no ill effects and began bearing again soon afterwards.

Since they have been taken away from their natural environment—the rain forests of South America—a great deal of care has to go to nurturing the trees in cleared areas of New Guinea. They thrive in humid heat, but cannot stand direct sunlight. This means that shade trees have to be planted—the most effective having been proved to be the easily propagated *Leucaena glauca*.

For Europeans the planting of these shade trees involves considerable expense as well as hiring labour; for village growers it calls for painstaking work that is new to them.

Soils

The volcanic soils of the Gazelle Peninsula and Kar Kar Island, an extinct volcano off the coast of New Guinea, near Madang, are particularly suitable.

Years of testing at the Keravat Experimental Station have proved the remarkable fertility of New Britain's pumice soils. These soils admit water readily and also hold it, so that it can be tapped by the very long roots of the cocoa tree.

Keravat has achieved some astonishing results. Covering 5,000 acres of good land near the Bismarck Sea, it has

Breaking the pods to extract the beans. They are placed in fermentation boxes for about a week and are then dried in the sun. The final drying is carried out in a hot-air drier

75 acres under cocoa and also test crops of coffee, fibres and various types of food. Much valuable research has been done in the well-equipped laboratories there.

Some record yields

Yields on its best cocoa blocks, first established in 1948, have exceeded 700 lb. to the acre. Some six-year-old trees have even yielded 1,000 lb. In other parts of the world over 300 lb. is considered a good return. The average per tree here is 6 lb., with some trees in the show block going as high as 8 lb.

But for the Japanese invasion of these islands during the last war, the industry would be further advanced than it is today. Occupation troops destroyed the plantations, forcing agricultural officers to make a fresh start with the few hundred trees still left standing after the war.

Prospects

Chocolate factories in Australia are already processing cocoa produced in New Guinea and a stable future seems assured. Already there is a good living in it for planters and villagers alike. But for Europeans who contemplate taking up land for cocoa a word of warning is necessary.

It is a costly business for the planter to establish himself in New Guinea. He has not only to wait four or five years for his first return, but he has also a fairly large establishment cost. This will depend on a number of factors, such as the availability of labour, transport costs, the accessibility, size and type of his lease, as well as the standard of living he is prepared to accept in the pioneering stage. The Department of Agriculture estimates that a man might reach the production stage at a cost of £25,000 for a moderate-sized property. This figure includes his labour, living expenses, plant and the building of a house. By living hard it might be possible to reduce this by, say, £5,000.

For village people the prospects are quite different. They provide their own labour and already form part of an integrated life that includes food and housing. Their future is in their own hands. In the next few years they will make steady inroads into more and more areas of virgin jungle, replacing it with shade and cocoa trees and transforming their own lives as rapidly as the landscapes are being transformed.

Sun-drying the cocoa beans. The man in the foreground is turning over the beans; the others are moving the sliding roof to protect them against threatened rain

Oil Crops in South Africa

Apart from small amounts of orange, peppermint, eucalyptus and buchu oils which are being produced in South Africa, very little has been done to develop the production of essential oil crops, even though the Union is importing about £500,000 worth of various essential oils.

A joint research programme has been started by the Horticultural and Botanical Divisions of the Department of Agriculture and the National Chemical Research Laboratory to obtain data on the economic possibilities of essential oil crops, when grown under South African conditions. Without information on the cultivation of these plants and the yield, quality and market value of the derived oils, the farmer has favoured crops which give him an assured return.

During the period 1920–37, a collection of essential oil plants was successfully cultivated in the National Botanic Gardens at Kirstenbosch in Cape Province, proving that certain plants of this type can be grown in the winter rainfall area; others will grow under arid conditions and essential oil crops could provide alternatives in areas where there is a danger of over-production of the crops usually grown.

Fruit Yields

It is useful and often interesting to know how yields of fruit on a garden scale compare with those which are obtained commercially.

The average private gardener is delighted when his apple trees yield a few bushels* of sound fruit but, when it is realised that a good crop of Bramleys should yield over 400 bushels per acre or about 350 lb. per tree then his delight is rather short-lived.

Yields of blackcurrants and redcurrants of 6–8 lb. per bush, in gooseberries of 6–10 lb. per bush, in raspberries of 1 lb. per ft. run of row and in strawberries of ½ lb. per plant are being obtained by good commercial growers and there is no reason why crops in the private garden should not compare favourably with these or even exceed them. With blackcurrants some phenomenally high yields have been recorded, the highest being a crop of 17 ton 6 cwt. obtained from 2,000 bushes in England, which works out at the astounding figure of about 19 lb. per bush.

Tomato yields vary considerably but from a cold house planted from mid-April to the beginning of May, a crop of 30 tons per acre is considered very good; this works out at about 1½ lb. per square foot of floor space.

* 1 Bushel = 40 lb.

New Publications

Control of the Plant Environment

Edited by J. P. Hudson. Pp. 240, illustrated. London: Butterworth. 1957. 42*s*. New York: Academic Press Inc.

Despite the common saying that we cannot alter the weather, we strive increasingly, in the cultivation of crop-plants, to influence for better the climate to which the plants are exposed. In the field, we regulate soil moisture by irrigation or mulching; in the planting of tropical crops, we may modify exposure to sunlight by shading; while, for crops under glass, greater use is being made of supplementary lighting to stimulate growth and to control flowering. Although interest in such practical measures is keen, our fundamental understanding of the plant's response to different conditions of the environment remains scrappy and imprecise, and it is encouraging to note that, with the development of new techniques, advance in this field of research is being made.

This book comes at a good time to tell what is known and what methods can be applied to gain knowledge, and to point out what is still not understood. It arose from an Easter School held in 1957 at the University of Nottingham on the subject of the control of environment in crop experimentation, and is a record of contributions made to that conference, arranged and edited by Dr. Hudson, whose appointment as Professor of Horticulture at Nottingham has recently been announced. In a short review it is hardly possible to refer to individual papers, though many merit notice, and the scope of the book may be indicated by the titles of its four parts.

The first part, on the effects of the environment on plants, contains seven papers dealing with different aspects of the plant's response to various conditions. Here is surveyed our knowledge of effects of heat and light, of moisture and wind, on the growth and development of plants. In parts 2 and 3, the control of environmental factors for experimental work and installations for effecting control, we turn to means of testing and assessing these effects. Besides an interesting account of the working of the Californian phytotron, there are useful descriptions of more modest 'growth-rooms' and cabinets built at smaller expense to raise plants under carefully controlled conditions. Here also are recommendations for the design of glasshouses for experiments on plants and equipment for the automatic exposure of plants to a fixed day-length. The fourth part briefly describes some demonstrations made at the conference on apparatus for controlling the environment of plants.

The book performs a most useful purpose in presenting, in concise and convenient form, a mass of information, some not published before, some scattered through a variety of journals. The contributions are of a high order, the book is well edited and produced, and those to whom the subject is of interest can hardly fail to find this book as stimulating as it is informative.

T. A. RUSSELL

Capital and Credit

Vol. II No. 4 of the International Journal of Agrarian Affairs is again concerned with Capital and Credit in Agriculture and contains articles by specialists on problems connected with agricultural capital from a further six countries of very varying backgrounds: Australia, West Germany, Greece, Italy, Japan and Yugoslavia. Published by Oxford University Press, price 5*s*.

*

East Africa High Commission

The tenth annual report of the East Africa High Commission is a record of the year's work carried out in the three East African territories of Kenya, Tanganyika and Uganda in the economic, social, scientific and medical fields.

The Agriculture and Forestry Research Organisation of the Commission has conducted research into the use of fertilisers and on the relation of vegetation, soil and climate. Studies of virus diseases and plants resistant to them are in progress and some varieties of cassava are under test. Efforts are being made to find a cassava strain that pigs will not eat. Sugar-cane, maize and sweet potatoes resistant to disease are also being developed. The serious damage to plants by eel-worm is being investigated, and the feeding value of different types of grass.

In the Meteorological Department research work is being done on rainfall and water evaporation.

Control operations of the desert locust in areas north of Kenya were hindered by truculent tribesmen, bad roads and abnormal rain, but young locusts were slaughtered in vast numbers. The Director considers that an independent international organisation is needed to carry out a survey of the extent of the desert locust region. Last year, 25 million dollars was spent on locust problems. This expenditure would have produced striking results if it had been used for a united effort; instead, there was a considerable loss in efficiency due to unco-ordinated work by the countries concerned.

*

FAO Publications

The 1957 *Annual Review of World Production and Consumption of Fertilisers*, as in previous years, sets out to record and analyse the production and consumption of commercial fertilisers which supply any or all of the three major plant nutrients in the different continents and countries of the world. It is based on information given in questionnaires and where such questionnaires were not completed and returned, information from trade and other unofficial sources has been used.

Estimates for 1957 indicate increases of 4% over 1956 in world production and consumption and forecasts for 1958 do not envisage any great change in consumption.

Principles of Tenancy Legislation. Since the better the relations between landlord and tenant, the more efficient the cultivation of the land is likely to be, this is an important study. Leasehold tenancy and the several forms of share tenancy in 20 selected countries are examined and by a comparison of the solutions under the different legislations of the basic questions involved, the underlying principles are brought out.

World Catalogue of Genetic Stocks – Rice, Supplement No. 6, 1957. This issue includes contributions from Egypt, Italy, Japan, Malaya, Formosa and the U.S.A. The full data for each genetic stock are given in tabulated form by the use of code numbers and it is thus very easy to compare any

particular characteristic in all the stocks listed. The country and station where the stocks are maintained are also indicated by code numbers; rice breeders desiring to obtain stocks are asked to communicate direct with the holders of the stocks.

*

Colonial Research, 1956-57

This report states that grants totalling £2,202,880 were approved for 101 new Colonial Research Schemes and 59 Supplementary Schemes in 1956–57.

These grants now bring the total sum allotted to Colonial Development and Welfare Research schemes since 1940 to about £16m.

About 35% of the gross allocation has been for agricultural, animal health and forestry schemes, 17% for medical research, 10% for fisheries research, 9% for tsetse and trypanosomiasis research, 8% for social science and economic research, 8% for pesticides research, 5% for research sponsored by the Colonial Products Council, 3% for anti-locust research and 5% for miscellaneous schemes, including building and road research.

Approximately 39% of the allocation has been for schemes to benefit the East African territories, 17% for West African group, 9% for the South-East Asian territories and Hong Kong, 10% for the West Indian colonies, British Guiana and British Honduras, 5% for Northern Rhodesia and Nyasaland and 20% for other territories and for schemes of general interest.

New projects during the year include: *General:* £3,600 for the construction of a tropical greenhouse for work on colonial problems by the Agricultural Research Council's Unit of Experimental Agronomy at the Field Station of the Department of Agriculture, University of Oxford, and a further £6,600 as a contribution towards the cost and maintenance of the Unit; £1,150 for a survey of research requirements for tropical meteorology. *Africa:* £99,616 for the organisation of agricultural research and land-use planning; £1,391 for a study of the economics of African farming systems; £292 for a study of African co-operation and African leadership; £52,400 for the Agricultural Research Services in Northern Rhodesia; and £14,487 for cotton pest research in Nyasaland. *Malaya:* £50,005 for the establishment and maintenance of an Experimental Rice Station. *West Indies:* £1,600 for herbicides research at the Imperial College of Tropical Agriculture, Trinidad; £2,300 towards a hurricane research project sponsored by the U.S. Weather Bureau. *Malta:* £2,000 for soil survey and £5,150 for economic research.

Obtainable from H.M.S.O. (Cmd. 321), price 11*s*.

*

Fruit, 1957

The Commonwealth Economic Committee's annual review shows that the total quantities of fresh, canned and dried fruit, and fruit juices entering international trade during the year were equivalent to about 10.6 million tons of fresh fruit, compared with about 10.9 million tons in 1955 and the 1934–38 average of 8.2 million tons. Fresh fruit exports from Commonwealth countries were for the first time in excess of the pre-war average, the result in particular of the development of apple, pear and orange growing in South Africa and of the banana industry in the West Indies. Frost damage to the Spanish orange crop in February accounted largely for the reduction in international trade in fresh fruit.

The upward trend in world production of most kinds of fruit may be expected to continue. Citrus fruit output in Spain is now making a good recovery, and elsewhere in the Mediterranean area, extensive new plantings are due to come into bearing in the next few years. Deciduous fruit production is increasing both in Western Europe and in Commonwealth countries, particularly in the case of apples. The U.S.A. continues to expand its output of citrus fruit, of which it is by far the largest producer, but has shown some decline in apple production and, on average, little change in output of other fruits. Total citrus fruit output of the major producing countries in 1956 was about three-quarters above the pre-war level; the rise in deciduous fruit output (not including cider fruit) was of the order of 40%.

Obtainable from the Secretary, Commonwealth Economic Committee, 2 Queen Anne's Gate Buildings, Dartmouth Street, London, S.W.1, or from H.M.S.O., price 5*s*.

*

A 25th Anniversary

The April issue of the *Empire Journal of Experimental Agriculture* is a special *Anniversary Number*, celebrating the 25th birthday of this well-known Journal, whose first number was published in March 1933. Mr. H. J. Page, C.M.G., O.B.E., formerly Principal of the Imperial College of Tropical Agriculture, is the present editor.

Sir John Russell, F.R.S., who has been Chairman of the Editorial Board throughout, contributes a Foreword: 'The First Twenty-five Years', in which he gives in his inimitable style a masterly summary of the advances in the last quarter century. The remainder of this Anniversary Number consists of specially contributed reviews of progress in various countries of the Commonwealth overseas; moisture conservation in Canada, plant breeding in Canada and in India, pastures in New Zealand, crops and pastures in South Africa and in the Federation of Rhodesia and Nyasaland, oil palms in Nigeria, and animal health in Australia.

*

Cocoa Research

The Annual Report of the West African Cocoa Research Institute, 1956–57, contains accounts of research carried out during the year at Tafo station and Ibadan sub-station under the following headings: virus research; black-pod disease; mealybug studies; capsid studies, pollination studies; establishment and maintenance trials; plant breeding and selection; vegetative propagation; root studies; physiology of fruiting; soil fertility, shade, and manurial requirements; and cocoa preparation and quality. Price 5*s*.

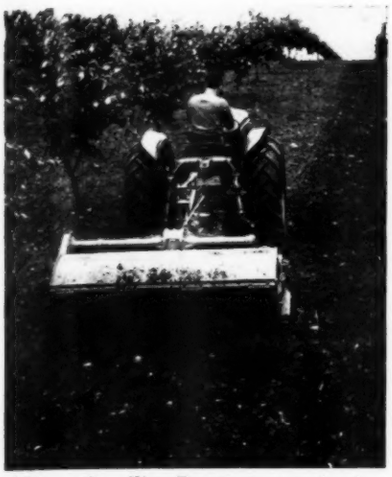
Bookshop Service

Books reviewed in WORLD CROPS and all other scientific or technical **books** may be obtained from:

Technical Books,
308 Euston Road,
London, N.W.1.
Telephone: Euston 5911.

Other miscellaneous publications reviewed should be obtained direct from the addresses given.

Machinery and Equipment



A Howard trailing Rotavator turning in a carpet of weeds in an orchard

The Mechanical Garden

This is the title of an interesting and useful brochure on the subject of mechanised gardening, which may be obtained from the makers of the Howard 'Rotavator' through our Reader Service. This machine is likely to find application, however, not only in private gardens, but also in market gardens and orchards, on farms, for the cultivation of tropical crops, at research stations, botanical gardens, experimental stations and at central nurseries for the production of planting material for distribution under government-aided schemes, such as those already in operation for tea, rubber and coconuts.

The aim of small-scale mechanisation in the garden is not merely to take the backache out of land preparation; it also makes it possible to do a larger amount of work in a short time, so that full advantage can be taken of favourable weather conditions or to hasten operations during the rush period. The ease and speed with which work can be done depends on the layout and spacing and on the correct planning of the operations.

The private gardener usually purchases one of the smaller machines – the 'Bantam', the 'Demon' and the 'Bullfinch'. The primary rotor width in these models is 10 in.; the main difference between them lies in the power available. The first is the most powerful and gives the widest range of speeds; the machines are light and easy to handle and no pushing or pulling whatever is necessary, as there is power drive to the wheels and to the digger. The 'Rotavator' does all the digging, hoeing and mowing necessary and only needs to be directed.

Reader Service

For further information on any item of machinery or equipment reviewed in this issue please write to:

Reader Service,
WORLD CROPS,
Leonard Hill House,
Eden Street, London N.W.1,
England

In large-scale agriculture rotavation has a wide range of applications: for the production of tilth for seedbeds, as a means of controlling weeds, for breaking up grassland, for mixing in fertilisers and manures uniformly into the soil, for incorporating crop residues evenly, for the shallow cultivation of orchards, for the reclamation of scrub and the clearing of headlands, and for the maintenance of forest plantations. For all of these operations both tractor-drawn and self-propelled 'Rotavators' of various rotor widths are available.

Planting

The planting holes for trees and shrubs must be wide enough and deep enough to allow free root development and growth. A large-size auger is now available for the Roper post-hole digger—a machine which will operate in rough, stony soil, on uneven ground or on hillsides. This implement will dig a hole 24 in. wide and 32 in. deep in less than a minute, thus making it easy to plant or transplant trees and in consequence obtain a return sooner than with small seedlings. Smaller size augers are available of 6 in., 8 in., 10 in., 12 in. and 18 in.—the last being recommended for coffee plantations. All sizes are easily interchangeable, and there is a four-way adjustment for angle digging which eliminates crooked holes.

Quicker Fruit Picking

Particularly in a variable climate, when delay may mean a crop spoilt by rain, speed in the gathering of fruit is of the utmost importance. The ideal in fruit harvesting also is to collect all the crop at the fleeting moment of perfection, for which speed is again essential.

A new hand tool which will speed up the harvesting of fruit should prove a real boon to fruit growers, particularly during the peak seasons. The Fordham picking aid fits easily over the wrist and is held in position by the thumb. It enables the picker to collect, single-handed, 1¼ lb. of fruit (equal,

The Roper post-hole digger will dig a 24-in. diameter hole in less than a minute

A David Brown Vineyard 2D tractor cultivating sloping ground on a vineyard in the South of France

for example, to 14 handfuls of currants) before emptying. It saves at least 14 unnecessary time-wasting motions and no fruit is dropped in the process. If desired, a picking aid can be used on each hand, and the picking speed consequently doubled.

Made of hard-wearing PVC plastic material, the Fordham picking aid is light-weight, hygienic, flexible and washable. It will give many years of service and saves its cost a hundred times.

Universal Joint

The ' Horti-Ball ' is a form of universal joint which can be used for the erection of all sorts of temporary structures in the home garden, the market garden and at agricultural research stations.

The ball itself has a diameter of approximately 2 in., is made of a tough, weather-resisting, hard rubbery material, and is drilled to accept light bamboo canes or stakes. For larger structures, the ball can be used for joining stout poles and posts by sending 4-in. nails through the holes in the ball.

In this way various frameworks can be built up, such as pea and bean netting supports, fruit tree and bush fruit enclosures, frames for protecting seedbeds and strawberry plants, and supporting frames for cloche glasses and also for polythene sheeting in glasshouses.

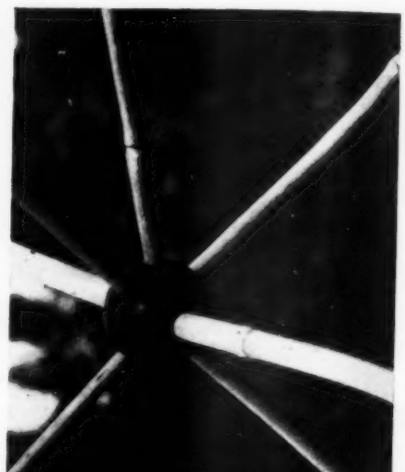
These balls, which can be dismantled and used repeatedly, provide a means for the speedy and effective erection of temporary garden and other structures of any size, and for many purposes.

Vineyard Tractor

As a result of modifications in design the width of the David Brown 2D tractor has been reduced to 1 metre (39 in. approximately), so that it can pass between rows of vines and carry out cultivation work in vineyards.

With plenty of sustained power from its 14-h.p., 2-cylinder diesel engine, this new version of the 2D tractor has shown in tests that the steep slopes of the typical French vineyard present no problem. Its balanced weight distribution gives good adhesion in varying soil conditions and the mid-mounted implements give yet another advantage on sloping ground, namely, that of stability, with consequently a higher degree of safety for the operator. With the driver so placed that he can see to manoeuvre accurately, the tractor can cover the full width between rows in one run with precision and economy. Because of its ability to make an almost square turn at the row end, an additional plant, or perhaps even two, can be added to the row.

In collaboration with Ets. Ferga, several new implements have been designed for vine cultivation. The most important of these is the vineyard plough, which is used between the rows in spring and autumn, and a specially narrow toolbar, to which standard hoes and cultivator tines can be fitted. A spray unit attachment is also made. This is an underslung tank, with the spraying unit driven from the p.t.-o. shaft.



The ' Horti-Ball ' showing how the canes fit into the holes in the ball

All-purpose Machine

The ' Mayfield ' Mk. 15 is a motor scythe with 20 optional, all-purpose attachments. It can be fitted with a circular saw for cutting timber up to $4\frac{1}{2}$ in. thick and logs up to $9\frac{1}{2}$ in. in diameter with two or three cuts; it can have a 32-in. roller attached and so be used for smoothing a lawn or a seedbed prior to drilling; it can be used to draw a flat-top trailer with a carrying capacity of 6 cwt.; a lifting fork can be fitted in front for picking up hay, compost, farmyard manure or cut vegetation; or it can be used to operate a ' Tarpen ' hedge trimmer through a 110-v. d.c. generator; similarly, a Beresford ' Stork ' centrifugal pump, with an output of up to 700 g.p.h., can be attached or a 20-in. lawn mower can be substituted for the standard scythe. Other forward attachments are a 36-in. snow plough or dozer blade, a front carrier for a large-capacity tipping wheelbarrow or for lifting milk churns or cloche glasses. The machine can also be converted into a sprayer by fitting a pump forward and trailing a spray tank behind. A 3-ft. trigger-release lance is provided for spraying the usual fruit

tree washes, for applying whitewash, creosote, disinfectants, or for anti-malarial operations.

In addition to all these many interesting uses, implements may be fitted for standard agricultural operations. Thus the ' Mayfield ' provides for the complete mechanisation of a small farm or holding with one power unit.

The engine is a 4-stroke Villiers petrol unit, which will run for a long period without needing any attention. The three forward speeds are 1¼, 2 and 3½ m.p.h. Full engine power is developed at each speed, which ensures efficient cutting of all types of growth, including reeds, bramble and bracken, when the machine is being used for its primary purpose as a motor scythe. The cutter bar is 36 in. wide. When the scythe meets a hidden obstruction damage to the engine and the mechanism is prevented by a shock absorber and by the flexibility of the V-belts, which actuate the scythe. Each of the wheels is fitted with a free-wheeling device to facilitate turning and the handle bars are easily adjustable for height. The wheels are dished and can be mounted either to give a narrow overall width or they can be reversed to give a track, 8 in. wider, for use across steep sloping ground.

Single-row Planter

Russell's single-row planter has been designed for the planting of undelinted and ginned cotton seed, but by changing the seed plates to ones with more or less seed pockets it can easily be adapted for planting most types of hard seed at spaced intervals where continuous sowing is required. Such seeds include groundnuts, millet, rice, maize, sorghum, wheat, oats, barley, soya beans, bambarra nuts, jute, sunflower, sun hemp, cow peas and various types of beans and grasses.

The Mayfield Mk. 15 being used for preparing succession seed beds for the cultivation of crops under glass

The machine is simple in design, robust in construction and has a single-speed gear. It can be drawn by a small draught animal, such as a donkey, or towed behind a light tractor. The opening coulter can be adjusted to vary the depth of planting from 1 in. to 4 in. The covering arms, which follow, are also adjustable for depth. A concave roller then rolls and thus consolidates the seedbed to assist germination. The planting mechanism is so designed that the seeds being planted are visible to the operator.

Eliminating Spray Drift

The Dorman ultra - low - pressure spraying system has been developed with the main object of eliminating spray drift to neighbouring fields.

Using the conventional type of sprayer with flat fan nozzles operating at from 30 to 40 lb./sq. in. pressure, the spray is produced by impacting a stream of liquid under high pressure through a restricting orifice. With the very sudden drop of pressure which occurs at the nozzle orifice, an unavoidable production of droplets of greatly differing sizes and weight results. Under conditions of even a light wind the smaller droplets will drift and could cause serious damage to neighbouring crops if they are susceptible to the spray being used.

The new Dorman ultra-low pressure hollow cone nozzle applying 10 gal./acre at 10 lb./sq. in.

(Below) *A conventional flat fan nozzle operating at the same rate and pressure*

The operator's handles of the Russell's single-row planter are adjustable for height, with good width to give stability

The new nozzle, which produces the spray in the form of a hollow cone, has been designed to operate at very low pressures, and for the low volume-rates normally employed the recommended operating pressure is 10 lb./sq. in.

A rotary motion is set up in the liquid in the nozzle chamber which imparts a centrifugal force to the liquid, breaking it up into fine droplets on leaving the nozzle orifice. A feature of the new nozzle is that at no point is there a sudden drop in pressure and the reduction of pressure occurs within the nozzle, so that any very fine droplets can be reabsorbed before leaving the orifice. This has resulted in the production of a high degree of uniformity of droplet size and the almost entire elimination of small, drift-prone droplets.

The new nozzle is arranged to fit the standard Dorman nozzle body so that the conversion of existing machines to the ultra-low-pressure system can be carried out without alteration to the equipment. The nozzle can also be fitted to certain other crop sprayers.

Three New Pumps

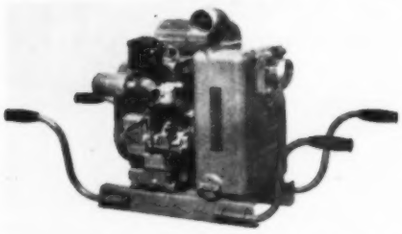
Three new automatic self-priming centrifugal pumps have been introduced by Goodenough Pumps Ltd.

Model 105HD, a high-head 3-in. pump, is fitted with a twin-cylinder air-cooled engine, either petrol or diesel, and is portable.

Model 250 is a 2½-in. pump of particular portability and is arranged for carrying or for wheeling. It is fitted with a single-cylinder air-cooled petrol engine.

Model 315SJ is a high-capacity 3-in. pump and has a carrier with four handles which is designed specially for overseas. This pump also has a single-cylinder air-cooled petrol engine.

All three have the Goodenough oil-immersed sealing device which enables liquids of up to 25% solid content to be handled without wear to the pump.



The model 315SJ Goodenough pump has a special carrier designed for use overseas

Shoulder-mounted Sprayers

Two new shoulder-mounted low-volume mistblowers and powder dusters are announced by Kiekens Whirlwind (London) Ltd. They can be supplied as a mistblower, powder blower, or as combined equipment for both spraying and dusting. They are suitable for use in field crops, vegetables, soft fruits, glasshouse crops, tree and flower nurseries, orchards and plantation crops, such as tea, cotton and tobacco. A special version is available for use in banana plantations, which weighs 36 lb.

Type '25' is a very light-weight machine, weighing only 27 lb. and powered by an 0.85-h.p., 26-c.c., 2-stroke, air-cooled J.L.O. engine. The fan is directly coupled to the engine and has an air capacity of 9,300 cu. ft./hour.

Type '75' has a capacity of 26,000 cu. ft./hour and is powered by a 2.5-h.p., 75-c.c., 2-stroke, air-cooled engine. The fan is directly coupled to the engine in this model also, and the machine weighs 38 lb.

Specially designed shock absorbers and a foam rubber back cushion absorb all vibration from the engine and the machines are well balanced and comfortable to carry.

Rotary Cultivation

The 'Gardenmaster' is an all-purpose rotary digger of great versatility and simplicity and, although ideal for the ordinary gardener, it is also robust enough and powerful enough to be of equal value to the nurseryman, market gardener, fruit grower and poultry farmer, and for use in parks and playing fields.

The machine can perform many different operations: it can dig deeper than a spade on even the hardest ground, turn virgin land into a seed-bed, cultivate from 7 in. to 24 in., hoe and weed, ridge, cut rough grass or smoothly mow a lawn. It can even be used to trim hedges.

Power is provided by a J.A.P. 80-c.c., 2-stroke engine which develops 1½ h.p. at continuous and 2 h.p. at maximum rating.

Type '25' of the Kiekens Whirlwind mistblower weighs only 27 lb.

Inter-row cultivation in strawberries with the 'Gardenmaster'

The 'Gardenmaster' is just as suitable for use in tropical climates as in temperate regions, since it is not affected by high ambient temperatures. The engine is protected against dusty conditions and it is powerful enough to operate at any altitude where cultivation can be carried on.

The machine is propelled by the action of the rotor blades and the best results are normally obtained by letting the blades dig themselves in to the required depth and then effortlessly swinging the toolhead from side to side as the machine moves forward. By trench-digging backwards with the toolhead reversed, a perfect tilth can be obtained to a depth of over 12 in. The pick tines are specially designed for breaking hard or virgin ground and will effectively crumble any type of soil.

Tools and ancillaries can be rapidly fitted and changed. The toolhead can be removed merely by undoing a lever and it is so designed that it can be turned through 90° for fitting the spin weeder or through 180° in order to work the machine backwards. The tools can, in fact, be set at any angle.

Self-priming Pumps

A new range of self-priming pumps is being introduced to British and overseas markets by Hill-Barnes (Pumps) Ltd. These are now being made in Britain under licence to the design of the Barnes Manufacturing Co., of the U.S.A.

Agricultural Chemicals

Fungicides; weedkiller; insecticide; insulator for greenhouses; antibiotic for lettuce; liquid feed

Apple Scab

The fungus causing scab, *Venturia inaequalis*, overwinters mainly on old fallen leaves. When suitable conditions of temperature and moisture occur in the spring, *i.e.* almost every time the leaves are wetted between March and mid-June, reproductive spores called ascospores are discharged from these old leaves and are carried in the air on to the new leaves, buds and branches of the trees. The ascospore discharge is the chief means by which apple scab is spread. Later in the season another kind of spore, the summer conidiospore, develops from the new infections on the tree. These spores are carried about the tree mainly in surface water and are not easily air-borne on to other trees. The prevention of infection from the ascospores is vitally important in producing clean fruit.

A greatly improved fungicide for use against apple scab is now available for use by commercial growers this season. It is a liquid formulation of certain organo-mercurials combined with a fungicidal safety additive. Extensive trials by Fernhurst Research Station have proved it to be a very effective spray against apple scab, and safer than other mercurials on mercury-sensitive varieties. It may also be used as a routine protective spray and as an eradicant spray following a scab infection period.

This new fungicide, known as ' P.P.' Liquid Mercury Plus, has been developed by Plant Protection Ltd. Details of methods of use, spraying programmes, compatibility with other sprays, and cost may be obtained through our Reader Service.

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Lining for Greenhouses

An important application of film made from Bakelite polyethylene is for lining greenhouses; the film provides valuable insulation, thereby reducing the amount of heating required to keep the greenhouse warm. Many plants, such as tomatoes, lettuces and beans, achieve better quality when grown under a polyethylene lining, and it is also claimed by the makers that improved yields can be obtained. This, it is explained, is because of the greater moisture retention and lower heat loss at night due to dead air space between the glass and the inner lining of polyethylene film. This insulating layer also reduces the build-up of heat from the sun during the day. Further information is contained in Technical Memorandum D 114, obtainable through our Reader Service.

A greenhouse completely lined with polyethylene sheeting, manufactured by Bakelite Ltd.

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Micro-flora Fertiliser

' Morea ' is a liquid molasses-urea supplement for feeding stuffs, containing phosphoric acid, urea, ethanol, calcium and other minerals and also the necessary vitamins. When this product is given to a cow along with the vegetable proteins contained in the grass, fodder or concentrates she eats, the metabolic processes of the ruminant are accelerated, as no time-consuming enzymatic protein hydrolysis is necessary, nor is any carbohydrate fermentation required, according to the manufacturers of this interesting new product – the Feed Service Corporation of U.S.A. There is stated to be an increase in the micro-flora population in the rumen of the animal, where millions of bacteria, yeasts and protozoa are produced to play an important part in the growth and fattening of the ruminant.

Reader Service

For further information on any item reviewed in this issue please write to:

Reader Service
WORLD CROPS,
Leonard Hill House,
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Black Pod of Cocoa

Science has not yet discovered a fungicide which will control Black Pod of cocoa once the fungus has penetrated the pod. The principle of control must, therefore, depend on protection, that is, preventing the fungus spores from entering the pod. The simplest method of doing this is to apply a protective coating of Carbide Bordeaux to the developing pod so that the fungus spores, on alighting on the pod surface, come into contact

with the protective film of fungicide and are killed instantly.

This mixture has superior sticking properties, and leaves a visible deposit on the pod which enables the operator and supervisor to see if the spraying has been done properly.

All the recognised makes of spraying machines, including motor mist-sprayers, on the market are suitable for applying the mixture; which, in an emergency, may even be dabbed on to the pods with a brush.

The spray should be applied to all pods on the tree, irrespective of size. The spray lance should be held close enough to each pod to ensure a complete coverage.

Spraying should commence just *before* the start of the rainy season and it will probably be necessary to spray at three-weekly intervals during periods of heavy rainfall.

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Aid for Lettuce Growers

A new antibiotic, 'Griseofulvin', has been found effective for the control of botrytis (grey mould) of glasshouse lettuce. In some of the trials conducted by the Murphy Chemical Co. Ltd., who are marketing the material, it has been shown that where it was applied to lettuce plants, both before and after planting out, no losses whatever were sustained, but plots which had not been treated showed a loss from botrytis, as high as 14.3%. This means that less infected leaves have to be cut out, and as a result the marketable lettuces will be about 50% larger.

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Spray Additive

Many plant diseases are difficult to control because the organisms are not reached by fungicidal sprays. They resist wetting, and the water-borne fungicide runs off to the ground without contacting the spores or fungi.

Powdery mildew is an outstanding example of this type of disease. This disease (or, more accurately, family of diseases, since there are many varieties of powdery mildew) presents a fluffy, powderlike surface which is difficult to saturate with ordinary water sprays. With this natural protection, the spores grow rapidly and soon damage or destroy such crops as apples, pears, cucurbits, strawberries and various other fruits and vegetables.

It is similarly devastating on roses, lilacs, zinnias, hydrangeas and various other flowers, shrubs and ornamentals.

Triton B–1956 in fungicidal sprays ensures that the spray will come into effective contact with the disease organisms. It has been found that most types of powdery mildew can be controlled by the Rohm & Haas product 'Karathane', if a small amount of this additive is included in the spray formulation. A plain water spray would leave the material in droplets on the leaves and much would be lost by run-off; with the Triton-Karathane formulation, the spray spreads evenly as a long-lasting protective film over the surfaces of leaves, twigs, buds and even waxy fruit and thus fresh infections are prevented.

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For Agricultural and Horticultural Pests

DDT in emulsion form has been proved the safest and most efficient formulation of DDT for the control of a very wide range of insect pests of agricultural and horticultural crops. Its outstanding advantage lies in the fact that, although providing maximum killing power, it will not scorch the tenderest leaves.

The Murphy Chemical Co. Ltd. now offers DeDeTANE 25, which is a top-grade emulsion containing 25% DDT. This formulation is for killing mangold fly on sugar-beet and mangolds, pea pests, cabbage caterpillars, flea beetle, pollen beetle, clover seed weevil and leatherjackets. DeDeTANE can be applied in low volume in not less than 20 gal. water per acre, but for some pests, *e.g.* pea moth, it is necessary to spray high volume at 100 gal. dilute spray per acre.

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Scrub Control

'Trioxone' is a 2,4,5–T hormone selective weedkiller for the control of certain species of woody weeds and trees. It is particularly useful against bramble and gorse which is encroaching into pastures or present in rough grazing, and it may be used for scrub clearance in wastelands, in ditches and dykes and in forest firebreaks. It is also recommended for the control of alder, elder, hazel, willow, birch, chestnut and hawthorn. Some regrowth may occur, either in the same season or in the year following its application, and the treatment may have to be repeated. The areas so cleared need to be re-sown and properly managed or the woody growths may return.

The method of application depends on the species of woody weeds to be treated. It may be diluted with water, and sprayed over the foliage in late spring or summer after the leaves have opened, or it may be applied, diluted in oil, to the trunk or stem of each plant or to the freshly-cut stumps at any time of the year. Alternatively, tree trunks may be ring-barked or frilled with an axe before the oil dilution is applied.

The manufacturers, Plant Protection Ltd., state that the product is harmful to clovers and they recommend that swards with a high clover content should be spot-treated. Similarly, crops which are susceptible to hormones, could be damaged by drift or vapour and the usual precautions need to be taken in such cases.

A Royal Order

The fabulous £8 million royal palace in Baghdad is nearing completion in readiness for its occupation by H.M. King Feisal after his forthcoming marriage in June.

The firm of British Overhead Irrigation Ltd. have secured the contract to install an overhead watering system to cover the extensive lawns and flower beds surrounding the palace.

To maintain grass and flowers alive in the hot arid climate and the dry sandy soil of Baghdad water at the rate of 10 gal. per sq. metre must be applied every three days. This represents the equivalent of no less than 2¼ in. of rain.

The water will be pumped from the River Tigris, alongside the palace gardens, through several miles of underground mains, to convenient points dotted all over the vast area.

The system, which must be installed early this year, consists of a large number of their well-known 'Wizard' self-travelling sprinklers, sets of 'Giant Watersquares' on wheels, tennis court fixed watering systems and other types of sprinklers, including about a mile of fixed piping with special nozzles for watering narrow flower beds. It is one of the biggest systems of its kind ever undertaken by any specialist irrigation firm in this arid region.

World Crop Reports

INTERNATIONAL REPORTS

Cocoa

The Statistical Committee of the FAO Cocoa Study Group estimates world production of cocoa beans in 1957–58 at 747,000 metric tons, 154,000 tons less than the revised estimate of 901,000 tons of the 1956–57 crop.

Totals broken down into Continents are as follows : *North* and *Central America* 82,700 tons; *South America*, including an estimate for the *Brazil* winter crop, 212,600 tons ; *Africa* 437,000 tons ; *Asia* 5,900 tons ; *Oceania* 8,100 tons. In some instances, estimates for the smaller-producing countries are based on exports plus domestic usage.

In *Ghana*, *Nigeria* and *French Africa* the crop is estimated at 400,000 tons, which is 145,000 tons smaller than in 1956–57. The low production in these areas is due to excessive and protracted rainfall which inhibited the full development of pods and also caused heavy losses from black pod and other diseases.

Citrus

Small crops in the U.S.A. have reduced the northern hemisphere total citrus output in 1957–58, but production of oranges and grapefruit in competing areas is larger than last year. Lemon crops in both *California* and *Italy* are smaller than in 1956–57.

Total northern hemisphere orange and tangerine production is estimated at about 6 million boxes less than in 1956–57. North American production is about 25 million boxes lower than in 1956–57 because of small California crops and frost damage in Florida. Mediterranean orange and tangerine production is nearly 19 million boxes above 1956–57. Record crops in *Italy* and *Morocco* and the return to production of the *Spanish* coastal producing areas are responsible for the increase. Morocco produces mostly navels, Italy and Spain mostly blood oranges, and *Israel* only non-blood fruit.

Losses, due to frost in Florida, have reduced total northern hemisphere grapefruit crops by 4 million boxes from last year. Production in 1957–58 in major competing areas, *Jamaica*, *Trinidad*, *British Honduras*, *Cyprus* and *Israel* is 200,000 boxes higher than last year.

Total lemon production is nearly 3 million boxes less than in 1956–57 because of smaller crops in *Italy*, *Greece*, and *California*. The *Italian* winter lemon crop marketed from October 1957 to June 1958 is over 2 million boxes less than last year. Mediterranean summer lemon crops marketed from June to October 1958 are estimated at 400,000 to 600,000 boxes above last year because of a larger Verdelli crop in *Sicily* and a larger crop of Verna lemons in *Spain*. The size of winter lemons in both Italy and Spain is reported to be above normal.

Stone Fruits

Stone fruit production in the northern hemisphere in 1958 was 5% lower than in 1956. The figures for peaches and apricots showed a slight increase on the poor season of 1956; the plum, prune and cherry crops, however, were smaller than in 1956.

Production of both apricots and cherries increased in *North America* in 1957, with Canada and the U.S.A. both reporting gains. Canadian apricot production recovered completely, with a tonnage more than double that of 1956, which had been a small crop. Other gains were more moderate, and with reductions in the crops of peaches, and plums and prunes of 9% and 14% respectively, the result was a total North American stone fruit production not far below the 1956 level.

Production of apricots and peaches in *Europe* showed substantial gains over the small crops of 1956, with increases of 64% and 45% respectively. Crops in both 1956 and 1957 were adversely affected by weather conditions, the 1956 crop being substantially below average. In 1957, losses due to weather were confined to northern Europe and were offset by increased production in Italy, Yugoslavia and southern France.

Plums and prunes suffered considerably from spring frosts in most parts of Europe but, despite this, the crops were only 6% lower than in 1956, owing to slight gains in Italy and Spain and an increase of almost 180% in Yugoslavia. The cherry crop was likewise affected by frosts, but losses in northern Europe were counteracted to some extent by gains in southern Europe, producing a total that is about 20% below the average crop of 1956.

Hops

The world's 1957–58 crop of hops is expected to amount to about 141.2 million lb. This includes the crops harvested in the northern hemisphere countries in the later months of 1957 and those to be harvested in the southern hemisphere countries in the early months of 1958. It represents an increase of 12.4% over the 1956–57 crop, which amounted to about 125.6 million lb., and nearly 1% more than the 139.8 million lb., harvested in 1955–56. The estimated 1957–58 crop is somewhat smaller than the 1950–54 average, but it is about 7% larger than the average for the five years immediately preceding the second world war. Prior to the current season, world production had been declining steadily since 1953–54.

The reversal of this trend is due to increases in production over the past year in nearly all countries where hops are grown. Only in *Canada* and *Czechoslovakia* were substantial declines reported. Expansion of production was especially pronounced in the *U.K.*, where the crop increased by almost 9.3 million lb. or nearly 45% and in the *U.S.A.*, where the increase amounted to over 1.7 million lb. or 4.6%. Production also increased substantially in *Poland*, *Yugoslavia*, *Belgium* and *West Germany*.

The general increase in production is due partly to an increased acreage under hops and partly to somewhat better weather conditions during the current season in most of the countries where hops are grown. The increase in the U.K., where production has returned to the level maintained for some years before the relatively poor 1956 season, is attributed mostly to better growing conditions. The increase in the U.S.A. is attributed mainly to a 14% increase in the area planted to hops, which rose from 24,200 to 27,700 acres; there was, in fact, an 8.6% decline in yield per acre.

Union of South Africa

The new *maize* crop is expected to be slightly higher than average. Heavy rains followed by hot weather enabled Free State farmers to proceed with ploughing and planting in December. Adverse weather conditions and rust have interfered with the *wheat* crop, and whereas a record yield had been expected, the latest estimate is some 600,000 bags less than the previous season – 8.6 million bags compared with 9.2 million bags. The Department of Agriculture is conducting a thorough investigation into the rust plague which has been particularly serious in the north-eastern Free State. The *citrus* crop has come well up to expectations. By the end of November exports amounted to 7.7 million cases – about 1 million more than for the same period of 1956 and a new record. The estimate for this season's *grape* export is 3 million trays – slightly more than last season.

El Salvador

The *coffee* crop is expected to amount to about five-sixths of last year's crop, which is the average of recent years, and about a million bags of 150 lb. should be available for export.

There is an excellent *cotton* crop, probably at least as large as last year's 35,000 tons, from a smaller acreage. About one-tenth is consumed in the country. Success with both cotton and coffee owes much to the lavish use of fertilisers and pesticides.

The *sugar* crop is expected to exceed 50,000 tons of plantation white, and there will be a surplus for export. As production costs are high, this can only be sold in neighbouring countries.

Poland

It was reported in a previous issue (WORLD CROPS, 1957, 9, 509) that a yield of over a million tons of sugar was expected in Poland from the 1957 harvest. Figures now published in the Polish press indicate that this expectation has in fact been surpassed, with a total production of 1,060,000 tons of sugar by comparison with 760,000 tons in 1956.

During 1957, growers provided 76 million quintals of beet, the processing of which produced 1,010,000 tons of white sugar, 40,000 tons of unrefined sugar, and about 10,000 tons of brown sugar: in other words 38 kg. per head of population. Allowing for home consumption, this should leave for export about 230,000 tons.

India

India's *cotton* production in 1957–58 is estimated at 4,220,000 bales (500 lb. gross), a 4% increase on the 4,060,000 bales in 1956–57, and 10% higher than the 1955–56 crop of 3,840,000 bales. Cotton production in India has increased steadily, and the 1957–58 estimate represents a 66% increase over the 2,510,000 bales produced in 1947–48. Cotton acreage for 1957–58 is estimated at 21,000,000 acres, 6% above the 1956–57 area of 19,843,000 acres, and nearly twice the 1947–48 area of 10,932,000 acres.

New Zealand

The first official forecast of 1957-58 *apple and pear* crops in New Zealand is for 3.5 million bushels of apples and 570,000 bushels of pears. Production in 1956–57 was 3.4 million and 545,000 bushels, respectively.

Hawkes Bay area is expected to have a very heavy crop of apples, amounting to about 1.2 million bushels, which is 173,000 more than in the previous year; whereas apple production in Nelson is expected to be less as a result of late frost and hail and is estimated at 1.3 million bushels.

Uruguay

The *wheat* and *linseed* harvests have been adversely affected, rust being reported in certain zones. In late December, torrential rains flattened crops and impeded harvesting operations. The wheat yield is now likely to be less than expected and the previous estimate of an exportable surplus of 650,000 tons must be revised.

Cuba

The Government have announced that the 1958 *sugar* crop has been fixed at 5.5 million long Spanish tons. This compares with 5.15 million tons in 1957. There has been a certain amount of sabotage of the standing sugar crop destined for milling in 1958, but thanks to the measures taken by the Government and by the sugar industry itself, this damage has been negligible. The Government arranged for the guarding of crop areas and also advanced the statutory dates from which milling might be started. The mill owners for their part reached mutual arrangements whereby if the area feeding one mill were badly damaged, surplus areas normally serving other mills would have their crop diverted in order to reach a more equitable distribution of the crop coming to the various mills. In the event, only one is likely to be unable to operate in 1958 for lack of crops in the vicinity.

Up to the end of November, the value of exports of *tobacco* amounted to $45 million, compared with $40.7 million in 1956.

Rice production for the year ending June 1958 is estimated at 4.5 million quintals. Last year's production was 4.3 million quintals. Some 400,000 acres are under cultivation.

England and Wales

In most parts of the country cultivations during February were restricted by unfavourable weather, and with the exception of ploughing on lighter soils, field work was rather less forward than usual. Some progress was made with spring sowing on the lighter land, but otherwise the ground was unsuitable for drilling.

Wheat generally was strong and healthy, but some damage due to slugs and waterlogging was reported from several districts; *barley* was generally satisfactory; *oats* looked well; *rye* was vigorous and healthy; *beans* continued to make good progress and no serious frost damage was reported.

Leys were in good condition generally and made slight growth during the month; some poaching was reported. *Permanent pastures* on the whole were in a satisfactory condition except where heavily poached by outwintered stock; little growth was made.

Winter keep. Except in some areas winter keep was not unduly drawn upon, and supplies should be sufficient to meet requirements for the rest of the season. Kale and root crops were not damaged by frost.

Potatoes, on the whole, were keeping well, but conditions in clamps and stores was variable.

Acknowledgment is made to *For. Crops Mark.* and to *Spec. Reg. Inform. Services* for much of the information contained in the above report.

The item on England and Wales is abstracted from a report by the Ministry of Agriculture, Fisheries and Food.